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Managing Technology  
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## Schools unite to build T-3 research net

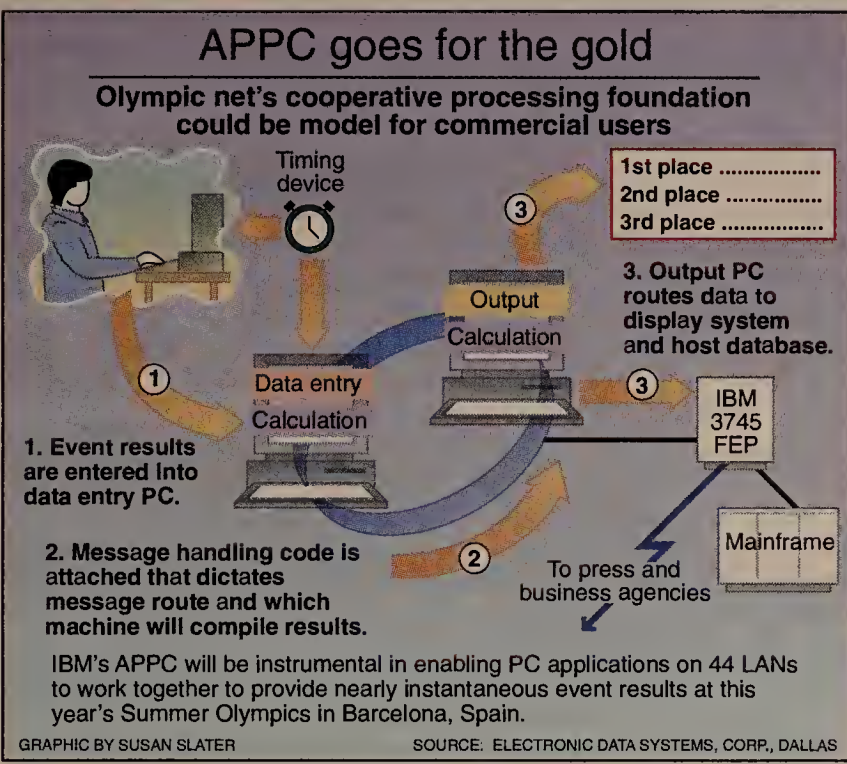
By Bob Wallace  
Senior Editor

PITTSBURGH — Thirty-one schools this week will announce plans to build a nationwide T-3 network that could prove to be the largest research and development net in the world.

The new Telecommunications Education Research Network (TERN) will support Switched Multimegabit Data Service (SMDS) as well as Asynchronous Transfer Mode (ATM) technologies. It will also be used to conduct voice/data research and laboratory experiments for studying the use, integration and interoperability of applications and nets.

The universities and technical schools will make TERN available to corporations and vendors for a fee, money the schools will use to enhance the quality of their telecommunications programs to attract topflight students and faculty members.

"When we pool the research faculty and combine it with the availability of a test bed network, we could have the largest [telecommunications] R&D resource (continued on page 10)



## Olympic LANs to showcase network prowess of APPC

By Caryn Gillooly  
Senior Editor

BARCELONA, Spain — As always, the Summer Olympics will bring together some of the world's finest athletes, but this year, it will also showcase a world-class LAN internetwork running cutting-edge distributed applications.

The net, which will provide instantaneous access to event results and virtually every other

type of Olympics-related information, will use IBM's Advanced Program-to-Program Communications to enable applications to automatically establish links across the internet on an as-needed basis.

The distributed client/server net has to meet many of the requirements of commercial networks, such as synchronizing input from multiple resources, (continued on page 6)

## Vendor trio positions hubs as LAN servers

By Bob Brown  
Senior Editor

Novell, Inc. last week announced it has joined forces with NetWorth, Inc. and Ungermann-Bass, Inc. to help users employ wiring hubs as servers running NetWare and LAN applications.

NetWorth and Ungermann-Bass worked with Novell to modify their hubs to support a slimmed-down version of NetWare 3.11, dubbed NetWare Runtime, and a variety of NetWare Loadable Module (NLM) applications from Novell and other developers.

Ungermann-Bass will support NetWare and the local-area network applications via its new Access/Open, an expansion device for the company's Access/One hub. Based on industry-standard buses, Access/Open will house processing modules running various network operating systems and applications — a shift from closed hub architectures that support only a handful of functions from the hub vendor and select partners.

The announcements could simplify network management and improve security by enabling users to consolidate applications and network devices. Customers (continued on page 10)

Large mux fills T-1/T-3 gap			
	Circuit cost per month		
	T-1	T-3	Mega-T*
Access line	\$800	\$6,000	\$3,000
Long-distance line			
250 miles	\$4,000	\$46,250	\$16,000
1,000 miles	\$10,000	\$150,000	\$40,000
Total cost			
250 miles	\$4,800	\$52,250	\$19,000
1,000 miles	\$10,800	\$156,000	\$43,000

\*Mega-T mux supporting 4 T-1s

See story, page 2

SOURCE: LARSE CORP., SANTA CLARA, CALIF. GRAPHIC BY SUSAN SLATER

### NETLINE

**PUBLISHING HOUSE** embarks on project to release research journals to universities over the Internet. Page 2.

**BELL ATLANTIC** announces plans to begin offering frame relay service early next year. Page 4.

**SYSKONNECT** software expands PC users' reach to variety of servers. Page 4.

**IBM TO SELL OFF** its remaining 50% stake in Rolm to Siemens. Page 4.

**HUGHES UNWRAPS** new Enterprise Hub. Page 6.

**SELF-HEALING NET** to be implemented in New Jersey Bell territory. Page 6.

**DEC, CISCO UNITE** to address low-end routing mart. Page 6.

### FEATURE

## New LAN bridges adapt to changing user needs

By Patricia Cope  
Special to Network World

Bridges used to link local-area networks are undergoing a personality change of sorts.

Vendors are adding variable levels of routing, allowing users to deploy bridges to tie LANs together and later invoke routing capabilities as additional protocols are added to the networks.

They are also taking steps to

beef up the basic features of their bridges by offering larger address tables, complex filtering, load balancing and increased support for network management protocols such as the Simple Network Management Protocol.

Products are being outfitted with a wider selection of wide-area network interfaces, better Fiber Distributed Data Interface support and (continued on page 37)



## Bill would give Congress MFJ control

By Anita Taff  
Washington Bureau Chief

WASHINGTON, D.C. — Rep. Jack Brooks (D-Texas) last week unveiled legislation to wrest control of the Modified Final Judgment away from the U.S. District Court and plot a course for the RBHCs to enter all restricted businesses, including long distance and manufacturing.

The bill — which drew both brickbats and applause — would shift oversight of the regional Bell holding companies from U.S. District Court Judge Harold Greene, who currently administers the Modified Final Judgment, to the U.S. attorney general.

The legislation is unprecedented because it deals with all Modified Final Judgment issues in (continued on page 8)



# Publisher will distribute journals over the Internet

Will make it possible to download copyrighted material to colleges, raising thorny legal issues.

By Ellen Messmer  
Washington Correspondent

NEW YORK — Elsevier Science Publishing Company, Inc. last week said it will launch a much-debated project that will allow universities to access and download Elsevier's research journals electronically over the Internet.

The three-year project, called The University Licensing Program (TULIP), marks the first time a major publishing house has ventured to release published, copyrighted work over the Internet. As an experiment full of technical and legal challenges for

Elsevier and the 15 universities involved, it will be a proving ground for network-based information exchange.

The growth of the Internet, which has fostered information exchange among academic institutions, has prompted universities to ask publishers to make books available in electronic form so that researchers could download entire journals or portions of them. In addition, university libraries are complaining that shrinking budgets have left them unable to purchase the entire range of paper-based publica-

(continued on page 8)

# Cisco announces product that merges net functions

Central and remote sites can share services.

By Maureen Molloy  
Senior Writer

MENLO PARK, Calif. — Cisco Systems, Inc. last week announced a new device that merges the functions of a terminal server, router, protocol translator and X.25 PAD.

The Cisco Communication Server (CCS) is intended for remote sites and can connect 112 asynchronous devices, including terminals, personal computers, printers and modems, to remote Transmission Control Protocol/Internet Protocol- or Local Area Transport (LAT)-based nets.

Additionally, it can provide

protocol translation and supports TCP/IP routing over dial-up lines, enabling remote users to share local-area network services with users at a central site.

"When users can have multiple functions in one box, they will no longer be willing to pay thousands of dollars each for devices that connect terminals, translate protocols and route data over ordinary phone lines," said John Morgridge, Cisco's president and chief executive officer.

The CCS is offered in two models — the 500-CS and ASM-CS. The 500-CS is equipped with

(continued on page 63)

# Larse inverse mux lets users pool multiple T-1 circuits

By Michael Cooney  
Senior Editor

SANTA CLARA, Calif. — Network users feeling constrained by single T-1 bandwidth can now move closer to T-3 speeds with a new inverse multiplexer that Larse Corp. will announce next week.

The Mega-T Multi-T-1 Access acts as an inverse mux that pools multiple T-1 lines, enabling users to connect devices such as routers and bridges to high-speed data links without replacing existing customer premises equipment or carrier services.

By combining four to eight T-1

lines into a single pool of bandwidth, the Mega-T provides users with access to up to 12.288M bit/sec of bandwidth.

For many users, that will fill a gap between the 1.544M bit/sec capacity of a T-1 link and the 45M bit/sec offered with T-3 lines, which often cannot be cost-justified.

While providing high-speed local-area network internet connections will be Mega-T's primary role, analysts said the product should also support faster disaster recovery and backup applications.

(continued on page 8)

## Briefs

**Oracle to offer stepping stone to Version 7.** Oracle Corp. is scheduled to announce today that it will make available a development release of the long-awaited Version 7 of its relational database management system and push back the release of the full product to June 15. The interim release will enable users to begin building applications that take advantage of Version 7's new features. It will support Digital Equipment Corp.'s VMS, IBM's OS/2 and AIX, Sun Microsystems, Inc.'s OS, Hewlett-Packard Co.'s HP/UX, as well as other Unix platforms.

**SMC set to unveil SNMP support.** Standard Microsystems Corp. (SMC) will unveil next week at INTEROP 92 Spring a Simple Network Management Protocol-based management application for its 351 2TPi intelligent Ethernet hub and new capabilities that will let Novell, Inc. NetWare users take advantage of SNMP functions using the Novell Internetwork Packet Exchange (IPX) protocol. SMC will also announce that it has joined Cabletron Systems, Inc.'s Spectrum Partners and Hewlett-Packard Co.'s OpenView Solution Partners Program to ensure that SMC's products work with these vendors' management platforms.

**PacBell teams with Sprint to offer nationwide 800 service.** Pacific Bell last week announced that it is working with Sprint Corp. to offer users in California an 800 service that can be used nationwide. The service, expected this summer, will let customers advertise one 800 number for use anywhere in the country.

**Frame Relay Forum seeks user input.** The Frame Relay Forum is inviting interested users to attend its second annual meeting, which will be held May 18 in conjunction with the INTEROP 92 Spring conference in Washington, D.C. The meeting will focus on the international status of frame relay. Registration is \$50 and can be arranged by calling (415) 962-2579.

**MCI wins its largest commercial contract.** MCI Communications Corp. last week landed its largest ever commercial contract, a four-year \$250 million deal to provide domestic voice services to Citicorp. Under the agreement, Citicorp will use MCI's Virtual Network (Vnet) service, MCI 800, Vnet Calling Card Service and MCI Forum, a teleconferencing offering. The contract makes the carrier Citicorp's primary domestic long-distance service provider.

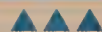
**New links to the former Soviet Union.** IDB Communications Group, Inc. last week announced satellite services to the former USSR that will be offered in cooperation with the Russian Satellite Communications Co. The agreement provides for dial-up and private-line voice and data service between the U.S., the Commonwealth of Independent States and the Baltic States using the Russian Intersputnik Statsionar 5 satellite.

**LAN cards fix themselves.** Optical Data Systems, Inc. has upgraded the Simple Network Management Protocol-based software for its token-ring hubs to reduce recovery time after a failure caused by things such as connecting a personal computer adapter card set at the wrong speed. Instead of waiting for a central station to seek out the cause of an alarm, the upgrade allows each hub to handle its own error-correction routine and take action. In 95% of the cases, recovery is performed in nine seconds or less and without human intervention.

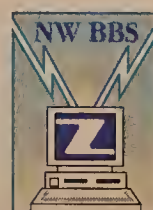
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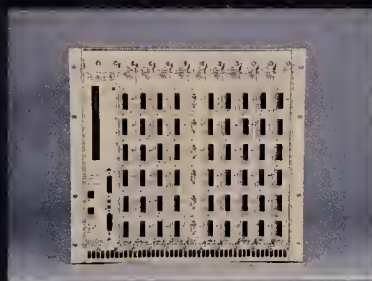


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# SysKonnnect airs software that links servers

By Margie Wylie  
Senior Editor

SARATOGA, Calif. — Ernst Gemassmer, chief executive officer of SysKonnnect, Inc., wants users to forget everything they've ever heard about making personal computer clients work with different servers and just buy his company's product.

SysKonnnect's SK-Passport is a \$99 software package the company claims will let DOS and Microsoft Corp. Windows users simultaneously access Novell, Inc. NetWare and Microsoft LAN Manager, in addition to AppleTalk Filing Protocol- and Unix-based servers over an Ethernet network.

The software works by replacing the usual hodgepodge of network interface card drivers and protocols with SysKonnnect's own set of universal drivers, which only require a 3K code module to work with different makers' network interface cards.

The practical upshot is that customers can load one set of drivers and get at many different kinds of local-area network servers simultaneously. Under DOS, users simply map different drives to different serv-

ers. Windows users access different servers through standard facilities and icons.

"It also allows, for the first time, a network services manager to buy the best application for a job, no matter what kind of server it needs," said Richard Krebs, vice-president of marketing at SysKonnnect. "Users will never know if they are accessing a LAN Manager, or a Novell or Banyan server."

This grand unification scheme will sound familiar to users who have heard Novell and Microsoft evangelizing their universal driver interfaces. FTP Software, Inc.'s Packet Driver (Transmission Control Protocol/Internet Protocol), Microsoft's Network Driver Interface Specification (NDIS) and Novell's Open Datalink Interface (ODI) drivers will work with SK-Passport specific drivers, Krebs said.

"We are probably the biggest enhancement to [NDIS and ODI] technologies yet because we don't make you choose," he said.

But for users who have already made a substantial investment in their networking software, "The question is, will they pay extra for a service they think they should already be getting?" asked Jodi Mardesich, a San Francisco-based analyst with The Burton Group.

SK-Passport will be available this month for Novell/Eagle Technology, Western Digital Corp./Standard Microsystems Corp. and 3Com Corp. Ethernet cards. The introductory price is \$99. □

# IBM to bail out of PBX market, sell Rolm unit shares to Siemens

By Bob Brown and Bob Wallace  
Network World Staff

SANTA CLARA, Calif. — In what appears to be the final chapter in IBM's adventures in the PBX market, Big Blue last week said it is selling its 50% stake in Rolm Co. to Siemens AG.

Officials from IBM and Siemens, which owns the other half of Rolm's marketing organization as well as the entire Rolm Systems manufacturing group, stressed that users will not see much of a change in the near term. IBM and Siemens will continue to cooperatively develop computer-integrated telephony applications, and IBM's sales force will still market Rolm products.

Sole ownership of the company should streamline bureaucracy and help the company get new products to market faster, said Peter Pribilla, who was named president and chief executive officer of Rolm, a new organization formed by Siemens to unite Rolm Co. and Rolm Systems.

"Now we have one organization, one management team and one vision," Pribilla said.

IBM and Siemens expect the deal to be finalized soon, pending government approval. Financial terms were not disclosed. The deal effectively ends IBM's unprofitable involvement with Rolm, which it bought in 1984 for about \$1.5 billion.

IBM acquired the private branch exchange maker to position itself for the anticipated convergence of the voice and data communications equipment markets. Instead, IBM wound up losing hundreds of millions of dollars when the integrated voice and data market failed to develop as expected.

In 1989, IBM and telecommunications giant Siemens entered into an agreement under which the two companies formed Rolm Co. in Norwalk, Conn., to handle Rolm marketing and support services. Siemens also acquired Rolm's manufacturing

and development organization here from IBM and named it Rolm Systems.

Dick Anderson, director of IBM North America's Network Systems group, said IBM had no plans to end the Rolm relationship then. But a combination of factors, including IBM's ongoing reorganization, convinced company executives to sell.

Siemens will run the new Rolm and Tel Plus Communications, Inc., a telecommunications equipment reseller, under its Siemens Private Communication Systems organization.

**"Now we have one organization, one management team and one vision," Pribilla said.**

▲▲▲

Rolm users were not surprised by the change.

"We had anticipated [this] for some time," said William Ziegler, a net manager with Central Hudson Gas & Electric Corp. in Poughkeepsie, N.Y. "The amount of joint marketing between IBM and Rolm had fallen off during the last year. We took that as an indication the companies were moving away from each other."

Patrick Springer, director of communications consulting with Computer Task Group, Inc., a Lowell, Mass., consultancy, said Siemens will move quickly to improve efficiency. "We'll see Siemens drive down costs to make it a low-cost PBX provider," he said. "Hopefully, Siemens will do whatever it takes to stem the flow of talented marketing and sales staff. This has hurt the company." □



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# Bell Atlantic to offer frame relay alongside SMDS

By Anita Taff  
Washington Bureau Chief

WASHINGTON, D.C. — Bell Atlantic Corp. next week plans to announce at INTEROP 92 Spring here that it will roll out a frame relay service early next year, company officials told *Network World* in a briefing.

The carrier is currently trialing frame relay interfaces and features internally and negotiating with customers willing to host beta tests that are scheduled for the fourth quarter. Bell Atlantic officials said the exact rollout date, pricing and service features will be largely determined by the customer trials.

The frame relay offering will comple-

ment the carrier's Switched Multimegabit Data Service (SMDS), making Bell Atlantic one of the first regional Bell holding company to announce firm plans for both types of high-speed data network services. Ameritech and BellSouth Corp. also plan to offer both services by year end.

In February, Bell Atlantic became the first RBHC to roll out a commercial SMDS service. That offering, which is slightly scaled down and lacks some of the features of full SMDS, was purchased initially by the General Services Administration.

Both frame relay and SMDS can be used for bandwidth-intensive data applications such as local-area net interconnection.

Although both services offer some similar features, experts generally regard frame relay as most appropriate for bursty traffic and intracompany communications. SMDS can support higher speeds than frame relay and, due to its sophisticated addressing capabilities, is appropriate for traffic between different corporations.

(continued on page 10)



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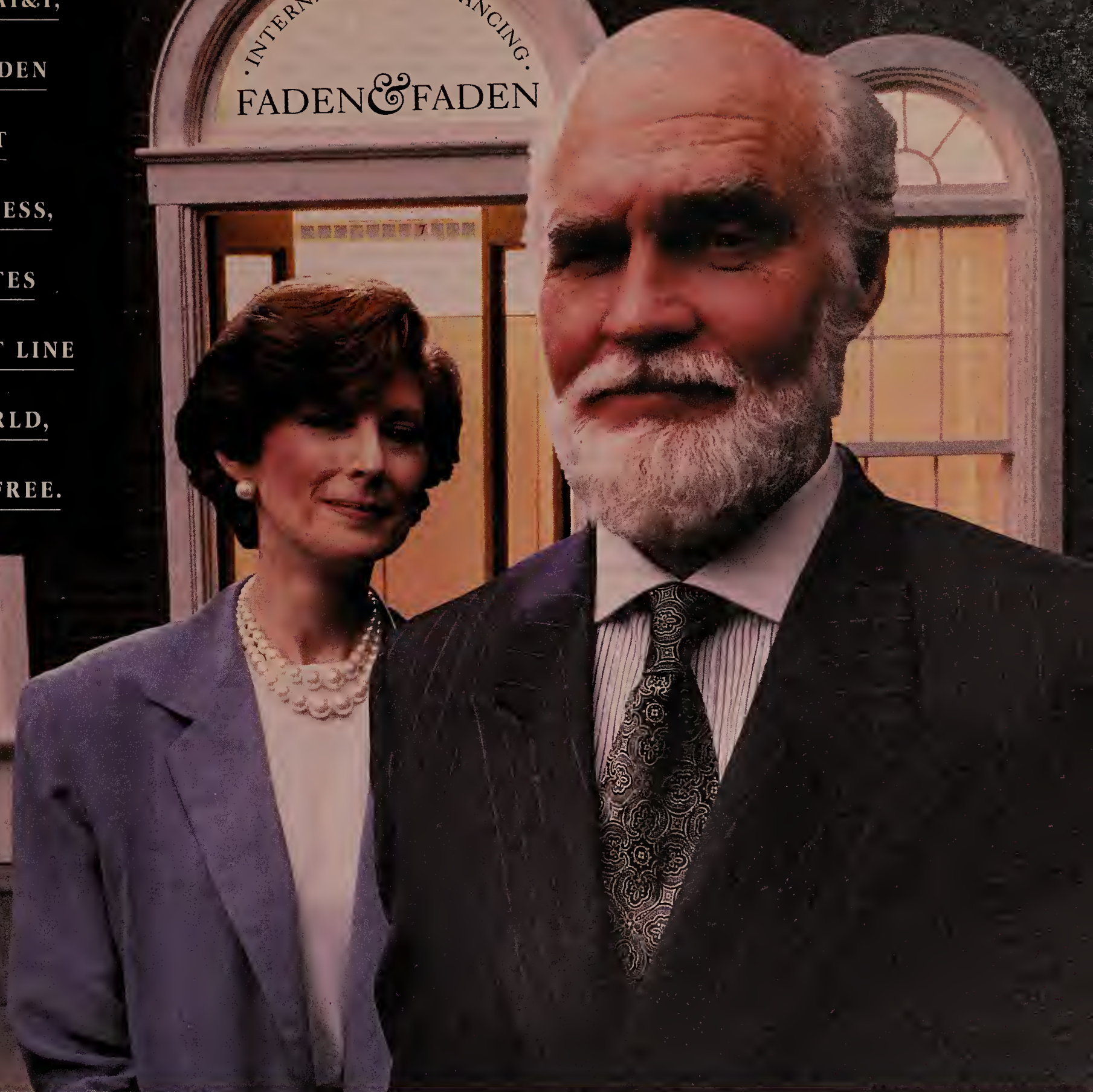
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# Hughes rolls out 3G hub targeted at remote users

Also unveils four RISC modules for intelligent hubs.

By Maureen Molloy  
Senior Writer

MOUNTAIN VIEW, Calif. — Hughes LAN Systems, Inc. last week announced a five-slot model of its gigabit Enterprise Hub, making it the first vendor to target a third-generation hub to remote-site users.

In addition, the vendor announced four new Reduced Instruction Set Computing (RISC)-based Ethernet modules for its intelligent hubs.

Hughes' new low-end hub incorporates the same backplane architecture as the company's 14-slot Enterprise Hub, which was introduced last fall.

The Model 1100 has 11 buses

that deliver more than 2G bit/sec of aggregate throughput. It supports modules for 10Base-T, Ethernet token-ring nets, Fiber Distributed Data Interface local-area nets, and synchronous and asynchronous terminal servers.

The 1100 will offer Simple Network Management Protocol agents on every module and come equipped with redundant power supplies with load sharing.

Available now, the Model 1100 is priced at \$1,995.

Hughes also unveiled four Intel Corp. i960 RISC-based bridging, terminal server and management modules for the five-slot and 14-slot enterprise hubs.

The Local Multi-Port Ethernet

Bridge Module spans all three Ethernet backplanes within the hub and offers one external Ethernet connection. This contrasts with traditional hubs that require multiple two-port bridge modules to interconnect more than two backplane segments within the hub.

The bridge forwards Ethernet traffic at 28K packet/sec and has a packet filtering rate of 56K packet/sec. It also provides source and destination filtering to reduce traffic and provide access control between segments.

Available now, the bridge costs \$4,795.

A second bridging module is the Broadband-to-Ethernet Bridge, which can link hubs over a broadband token bus. It can also link coaxial broadband networks with hub-attached Ethernet devices that utilize twisted-pair wiring. The bridge can connect hubs as far as 24 miles apart, and it

(continued on page 63)

# DEC, Cisco team up to build routers

By Jim Duffy  
Senior Editor

WASHINGTON, D.C. — Digital Equipment Corp. and Cisco Systems, Inc. next week will disclose at INTEROP 92 Spring here plans to jointly develop and market low-end routing products for large companies' remote offices.

The two firms will announce a relationship under which DEC's Low End Networks and Communications group will license routing and protocol software from Cisco. DEC will couple the software with routing hardware in a number of forms, including a module for the DEChub 90.

DEChub 90 is a low-end Ethernet concentrator that houses bridges, repeaters and terminal servers. Reports of a DEC-Cisco collaboration on a DEChub 90 module surfaced earlier this year ("DEC, Cisco huddle on router module," Briefs, NW, Feb. 10).

Observers believe DEC will also use the routing software on other platforms, including Intel Corp. personal computers as well as MIPS Computer Systems, Inc. and DEC Alpha workstations. This would enable users to configure desktop systems — ranging from low-cost PCs to higher performance Reduced Instruction Set Computing workstations — as routers.

Sources believe the routers will be low-end devices that can forward between 500 and 3,000 packet/sec.

Further details on upcoming product announcements were unavailable at press time.

A DEC spokesman would neither confirm nor deny the Cisco partnership. DEC already sells

Cisco routers as components of system integration projects.

Michael Maniglia, Cisco's manager of business development, also declined to comment on the expected announcement, although he said, "DEC is one of our strategic partners. We hope to expand the relationship."

According to analysts, the relationship will give users flexible packaging that may drive down the price of local-area network routing equipment.

"You'll have more capability in a smaller box," said Charles Robbins, director of communications research at Aberdeen Group, Inc., in Boston. "Users have to pick and choose solutions that give them scalability and multiple functions in the branch office."

Some observers expect DEC to position the routers, whether they are DEChub 90 modules or cards for PCs and workstations, as feeders for a network of DEC's Network Integration Server (NIS) 500 and 600 systems, which began shipping two weeks ago.

The NIS 500 is a two-slot device that sports a single-port Ethernet interface and routes DECnet, Transmission Control Protocol/Internet Protocol, Open Systems Interconnection and X.25 packets at line speeds up to 2M bit/sec. The NIS 600 is a seven-slot device that also routes DECnet, TCP/IP, OSI and X.25 packets at line speeds up to 2M bit/sec.

Analysts believe the routers will support DECnet, TCP/IP, Novell, Inc. Internetwork Packet Exchange (IPX), Apple Computer, Inc. AppleTalk and Xerox Corp. Xerox Network Systems net protocols.

They also speculate that the devices will support the Routing Information Protocol, Internet Gateway Routing Protocol and Open Shortest Path First routing protocols. □

# N.J. Bell to deploy SONET self-healing fiber network

By Ellen Messmer  
Washington Correspondent

JERSEY CITY, N.J. — New Jersey Bell Telephone Co. last week announced plans to deploy the nation's first 622M bit/sec Synchronous Optical Network (SONET)-based self-healing fiber-optic ring network.

According to New Jersey Bell, the installation of SONET Optical Carrier (OC)-12 rings to link central offices here beginning in August will lead to the introduction of fault-tolerant services for businesses. Carrier officials also said the SONET technology will enable them to cut the lead time for provisioning T-1 and T-3 facilities

from one week to one hour.

Nancy Sayer, Bell Atlantic Corp.'s manager of centralized engineering services, said New Jersey Bell, one of Bell Atlantic's local companies, will use fiber-optic cable to interconnect at least two remote digital net nodes, Journal Square and Bergen central office switches, and multiplexers at customer sites to create a Survivable Fiber-Optic Ring System.

At the heart of the new fiber ring is Fujitsu Network Transmission Systems, Inc.'s Fujitsu Lightwave Multiplexer 600 Add/Drop Multiplexer (FLM 600 ADM). The FLM 600 ADM equip-

ment to be installed at the two central offices and additional nodes will be able to sense interruptions on the dual fibers linking the nodes and reroute traffic to the surviving path.

"If you have a cable cut, within 50 msec, your service would automatically follow a second path," Sayer said. New Jersey Bell plans to initially deploy approximately eight OC-12 rings throughout the city.

Greg Wortman, manager of marketing communications at Fujitsu, claimed that the FLM 600 ADM is the only multiplexer on the market that implements Bell Communications Research's Path Protection Switched Ring standard for the 622M bit/sec SONET OC-12 speed.

"The multiplexing is duplicated; it's sending the same signal east and west," he said. When traffic running along dual paths reaches a common net point, the signals are compared, then one set is discarded and the other delivered to the destination point.

New Jersey Bell will run fiber-optic cable and install the FLM 600 ADM in office buildings where business customers are likely to need restoration services.

A carrier spokesman said about 30 large business customers, including banks such as the Bank of Tokyo Trust Co. and Bankers Trust Co., as well as the New Jersey State Treasury Department, now have offices here. New Jersey Bell expects that these customers may be interested in services provided through the Survivable Fiber-Optic Ring System. The company has not, however, determined which new services it will tariff for use with the ring network. □

# Illinois Bell net saves day

CHICAGO — Two high-capacity fiber cables and one copper cable owned by Illinois Bell Telephone Co. were severed last week, but service disruptions were prevented due to a self-healing fiber-optic ring the carrier installed two years ago in the downtown area.

The U.S. Army Corps of Engineers accidentally cut the cables during ongoing cleanup efforts after the flood that closed most of downtown Chicago last month. Workers cut the cables, which carry two T-3 and 202 T-1 lines into the heart of the city's business district, at 8:45 a.m. last Wednesday.

According to a spokeswom-

an for the carrier, the network repaired itself in 40 msec and users in the 37 buildings served by the ring did not lose service. "It was possible that data [transmissions] might have gotten a glitch, but customers never lost service," she said.

Users with sites on the ring include a new Sheraton hotel, the Montgomery Ward & Company, Inc. headquarters, the Merchandise Mart, and several banks and financial institutions.

Illinois Bell began construction on the fiber loop in May 1990, but this is the first time a major cut has tested the capabilities of the system.

— Anita Taff

# Olympic LANs to showcase APPC

continued from page 1

ensuring data integrity and providing redundancy, according to Electronic Data Systems Corp. (EDS), which is building the net.

Although it will be dismantled when the games are over, the lessons learned while building the network are expected to trickle down to commercial firms.

## Interlocked rings

The network, dubbed the Result Information System (SIR), consists of 44 logically independent token-ring local-area networks linked together and to a mainframe via a 16M bit/sec fiber-optic token-ring backbone,


said Elliot Mendleson, EDS account manager for the project.

Thirty-four of these LANs are responsible for collecting, tabulating and reporting the results of particular sporting events, while the other 10 are used as information centers. The mainframe acts as a database and file server for all of the LANs, collecting event results and providing historical and biographical information.

Communications among the LANs is achieved using APPC, which enables applications to establish peer-to-peer sessions on an as-needed basis without human or server intervention. Besides giving the applications a life of their own across the network, APPC makes it possible to pass on

(continued on page 8)





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## Publisher to distribute journals

*continued from page 2*

tions demanded by professors and students.

The prospect of network-based distribution promises to cause a revolution in the publishing industry. While publishers perceive electronic distribution as a new way to attract readers, they look with increased anxiety at the potential for wholesale copyright violation through easy duplication of network files.

But Elsevier, the largest English-language research publisher, is taking the plunge. "This is the first project that brings together the largest scientific and technical publisher and major universities in providing copyrighted, published information over the Internet," said John Gar-

rett, director of information resources at the Corporation for National Research Initiatives.

In the TULIP project, Elsevier will distribute 42 of its materials science journals over the Internet to approximately 15 universities, including Carnegie-Mellon University, Harvard University, the Massachusetts Institute of Technology, Princeton University and the University of California.

"We've been very concerned about electronic publishing," said Karen Hunter, Elsevier vice-president and assistant to the chairman. "We have to move further and offer networked distribution, preferably in ASCII-structured form. The libraries do not have the money to fund the

growth of the literature."

Although Elsevier's top management last week gave the go-ahead to the TULIP project, which had been under discussion for some time, both Elsevier and the universities still need to work out the technical and legal aspects of on-line access.

Hunter said Elsevier plans to begin scanning the pages of its publications and putting the data on optical disks for delivery to a database service provider, which will build a bibliographic and imaging database.

By this fall, a file server at Engineering Information, Inc. will begin handling distribution of the information over the Internet. Participating universities will have to set up their own file servers, and both parties will have to agree on common technical standards for delivery.

Another challenge lies in working out the legal arrangements. "There is the question of royalties," Hunter noted. "We're trying to deal wherever possible with subscription-based access. It's easier to simply give blanket permission. Fixed-fee access may be preferable, but some may want to 'pay by the drink.'"

Whatever the arrangement, Hunter pointed out that "in the end, you operate on good faith."

William Arms, vice-president of academic services at Carnegie-Mellon, said he was enthusiastic about TULIP. "Many of us believe that networks of digital information mean that in the next five to 10 years, we can build academic libraries that, for many purposes, are better and cheaper than paper-based libraries."

Stuart Lynn, vice-president for information technologies at Cornell University, said, "We're pleased Elsevier is moving forward with this. It will be an important step to learn about network access to journals and to explore the technical, legal and financial aspects together."

## Olympic LANs to showcase APPC

*continued from page 6*

information about how to handle the data exchanged.

"APPC was the only platform that let us implement a multiuser, multitasking network," Mendleson said. "With APPC, the network is fully distributed with no central point of focus. All the data can be manipulated by all users synchronously."

By comparison, end users in a typical LAN environment would have to establish the session links between applications to transfer information.

Although he was not sure if this is the largest APPC implementation, Mendleson noted that it is certainly one of the most unique. "This is probably the first time this type of application is running in such an exaggerated mode," he said. "We've got over 2,000 PCs connected. I don't think APPC has been used for anything like this before."

### Data entry

Each LAN-based PC is configured to be either a data entry device or a data output device. The data entry PCs are used to key in event results manually or are tied to devices that generate the information electronically.

On receipt, the application attaches message handling code to identify the information — racing results, for example — and to provide instructions on how to route the information throughout the network, perhaps to a scoreboard.

The event information is then either tabulated along with other

event data at the data entry PC or sent to an output PC for tabulation. After it is tabulated, the information is forwarded to the appropriate net resource according to the message handling code.

The data is also sent to the host, where a database management system keeps track of all Olympic-related information. The information is then further disseminated to more than 1,000 kiosks at the games and press agencies through wide-area network links.

### Learning from SIR

While SIR fits the bill for the Summer Olympics, Mendleson said the technology could also benefit mainstream applications.

In fact, one EDS customer based in Spain, which Mendleson declined to name, is currently in the process of setting up a similar network to keep track of company inventory, shipping and billing information.

This network, he said, would not be possible without the peer-to-peer capabilities of APPC.

The customer network, according to Mendleson, automatically handles almost every aspect of a customer order.

When an order comes in, it checks inventory to see if the requested product is in stock. If it is not, it orders one. If it is in stock, the system will automatically produce a shipping order to have the product sent out.

Once an employee records that the product has been shipped, the system automatically debits the customer's account and credits the company's account using electronic funds transfer technology. **■**



## SUNY plans digital library

ALBANY, N.Y. — The State University of New York (SUNY) next year plans to break ground on a digital library, even though the college does not have agreements with publishers to distribute material electronically.

Officials here said the new library building will be completed in about four years, and they hope by then the legal and technical precedent for electronic distribution will be set to support the shift from paper. SUNY is eager to move ahead with the project because the state already authorized funding.

The university plans to make its library accessible via the Internet to 64 other campuses in the SUNY system.

"We're optimistic that by the fall of 1996, these things will be worked out," said Christine Halle, associate provost on the Albany, N.Y., campus. Timothy Lance, associate vice-president

of information systems at the school, added, "The goal is to add fewer books and be a communications hub."

SUNY anticipates that legal uncertainties concerning copyrights may prove to be bigger obstacles than technical issues.

Carol Risher, director of copyright in new technologies at the Association of American Publishers (AAP), said the trade group supports the view that current copyright laws are applicable to net environments.

She said AAP's win last October in a copyright violation suit against Kinko's Graphics Corp. set a clear legal precedent that users must obtain permission before copying even parts of copyrighted material. AAP is ready to start policing networked environments, just as it now does violations of copyright through photocopying.

— Ellen Messmer

## Larse inverse mux pools T-1s

*continued from page 2*

In addition, it will also be useful for video, image and channel extension applications.

The Mega-T product line will feature four models — the MTD-401, 811, 802 and 812. The Mega-T 401 lets any device with a V.35 interface have immediate access to four T-1 lines, or 6M bit/sec of bandwidth. It will be available in the third quarter for \$17,500.

The 811 supports one High Speed Serial Interface (HSSI) on the local side, for connection to devices such as high-speed routers, and eight T-1 lines. HSSI is an emerging interface standard that

can support speeds up to 52M bit/sec.

The 802 supports eight T-1s and two local V.35 ports. The largest Mega-T, the 812, supports two local HSSIs and eight T-1 lines.

The last three boxes will cost as much as \$25,000, depending on configuration, and will be available by the end of the year.

Larse is also targeting the new products at carriers. WilTel, for example, already offers a fractional T-3 service but plans to package the Mega-T with its T-1 offering as an alternative to that service.

"We have customers who find T-1 isn't enough bandwidth for them but who can't get T-3 services or can't afford them," said

Michael Thompson, a network development engineer for WilTel. "This box solves that problem because it allows us to extend their T-1 service."

With T-1 prices going down and T-3 prices remaining high, analysts said the new Larse inverse mux will fill a hole that T-1 and T-3 mux vendors have left open, at least for now.

"The only way for most companies to justify T-3 lines is to have some really bandwidth hungry applications," said Peter Bernstein, vice-president of research at the Probe Research consultancy in Cedar Knolls, N.J. "With T-1 prices going down, most large users will keep buying T-1 lines. When they would step up to T-3 is unknown." **■**

## Bill would give MFJ control

*continued from page 1*

a single package. It is also the first proposed legislation to discuss RBHC entry into the long-distance market.

The bill sets up a blueprint that would allow the RBHCs to manufacture telecommunications equipment in five years and offer long-distance service in seven years. Also, it would allow the RBHCs to immediately begin manufacturing research and development and provide any service or product for which there is "a compelling competitive need and no actual or potential competition."

However, there is a big trade-off for the RBHCs: They would lose the right to provide information services, except electronic publishing, though they would be

able to reenter that business in three years. The Bells battled in court for years to have the information services restriction lifted before an appeals court granted their request last summer.

Reaction to the proposal was wildly mixed. About 1,300 users, consumer groups, information providers, newspapers, manufacturers and long-distance carriers signed a joint statement last week that supported the Brooks legislation. The group feared that allowing the giant RBHCs into new business areas immediately could extinguish competition, and it welcomed provisions to control the Bells' entry into new markets and to safeguard consumers.

Members of the group warned that the RBHCs might charge customers more for telephone service in order to finance new ventures and drive competitors out

(continued on page 63)





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## Trio positions hubs as servers

continued from page 1

will be able to off-load to hubs functions such as routing, electronic mail and IBM Systems Network Architecture gateways. Those functions may be better suited to run on hubs with high-speed backplanes than servers optimized for file and print services.

"We're seeing the integration of processing and communications under a common management framework," said James Herman, a principal at Northeast Consulting Resources, Inc., a Boston consulting firm. "We already have servers that can be hubs, and now we have hubs that can be servers. The distinction between hubs and servers is really beginning to blur."

Users also stand to benefit from Ungermann-Bass' open hub architecture, which will likely force other hub vendors to follow

suit.

"Ungermann-Bass is raising a different level of choice for the customer," Herman said. "This could really shake up the hub market."

### Access/Open

Duane Murray, vice-president and general manager of Novell's Network Management Products Division, said Novell gave the industry only half the story about merging hubs and servers when it introduced its Hub Management Interface last October. Novell also talked about the emergence of hub cards for departmental NetWare LAN servers.

"[Now] we are talking about the other half of the story where we take NetWare services and provide them [on] the enterprise hub to serve the larger customer," he said.

Ungermann-Bass' work with Novell has resulted in the hub maker's new Access/Open, the Access/One expansion device that supports as many as three Industry Standard Architecture bus-based modules featuring Intel Corp. 80386 or 80486-based processors.

The first modules for Access/Open will run Novell's NetWare Runtime, which runs NLMs, applications designed to work hand in hand with NetWare.

The Access/Ones will boast Simple Network Management Protocol agents, which will enable users to manage the devices via SNMP-based management systems, such as Ungermann-Bass' NetDirector.

In the next few weeks, Ungermann-Bass will make announcements with other vendors regarding Access/Open support for other net operating systems and applications, said Ralph Ungermann, the company's president

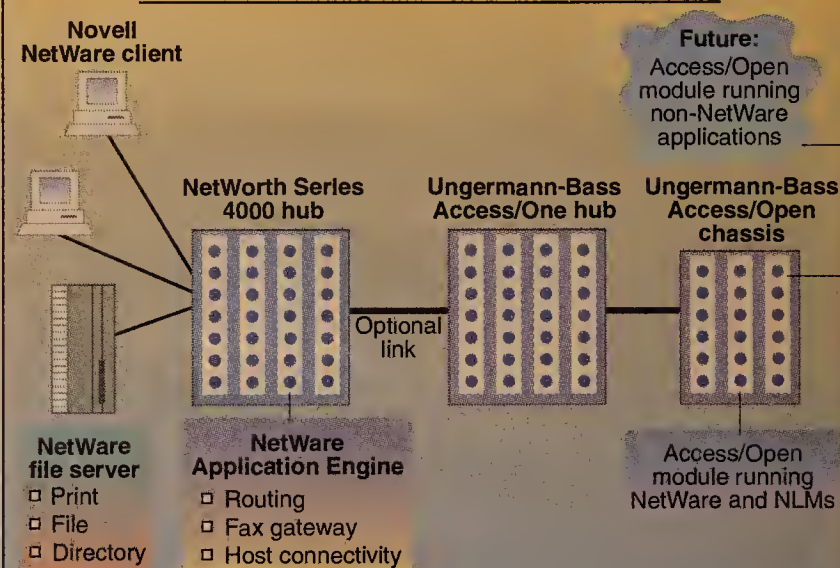
and chief executive officer.

Brad Noblet, general manager of Ungermann-Bass' product de-

velopment operations in Andover, Mass., said the hub maker

(continued on page 63)

## Bringing NetWare into the hub



## Schools to build T-3 research net

continued from page 1

in the world," said Jim Sobczak, president of TERN, a nonprofit group based here. He is a former president of the International Communications Association (ICA) and has worked for several vendor companies.

The TERN participant list reads like a who's who of institutions, including Carnegie-Mellon University, De Paul University, Georgia Institute of Technology, Michigan State University, Northwestern University, Stanford University and Texas A&M University (see graphic, this page).

A group of corporate sponsors — firms that have committed manpower, equipment, services or money to TERN — is equally impressive. It includes ADC Kentrox, Andersen Consulting, AT&T, Bell Atlantic Corp., Digital Equipment Corp. and IBM. ICA, MCI Communications Corp., Northern Telecom, Inc., Racal-Datcom, Inc. and Westinghouse Communications are also among the growing TERN supporters.

The network, which is being designed by Andersen Consulting, will be installed in phases, beginning in the third quarter, Sobczak said.

In the first phase, a T-3 node will be installed at the University of Pittsburgh, the University of Texas in Dallas and the University of Colorado at Boulder. The nodes will be networked using MCI-provided T-3 links and managed from a network control center in Pittsburgh.

Multiplexers at other schools will be used to support 64K bit/sec, 1.54M bit/sec T-1 or 45M bit/sec T-3 links to the backbone

nodes.

Each of the three backbone sites will contain at least one circuit switch and one SMDS-capable switch in the first phase, Sobczak said.

In the second phase, the group will install T-3 backbone nodes at Georgia Institute of Technology

### TERN participants

#### Include:

Ball State University  
Barry College  
California State University  
Carnegie-Mellon University  
Christian Brothers College  
City University of New York  
De Paul University  
George Washington University  
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University of Colorado  
University of Houston  
University of Kansas  
University of Maryland  
University of Mississippi  
University of Missouri  
University of Pittsburgh  
University of San Francisco  
The University of Southwestern Louisiana  
University of Texas

SOURCE: TELECOMMUNICATIONS EDUCATION RESEARCH NETWORK, PITTSBURGH

in Atlanta, New York and San Francisco, where there are clusters of participating institutions. At least one ATM-capable switch would be added to each backbone node site as part of this phase.

According to Sobczak, the T-3 backbone could be expanded further if necessary, and the group may add frame relay and X.25

packet switches.

To manage the net, TERN will initially use existing vendor-specific element manager offerings. It hopes to integrate the element managers in Phase 2 — scheduled for 1993 to 1995 — and eventually use a single Open Systems Interconnection-based system to manage the entire net.

But in the near term, TERN will enable the schools to expand their courses to include more than just classroom work.

"Telecommunications programs are strong on book learning, but that's about it," said Cory VanWorvelaeri, a partner with Andersen Consulting in Chicago. "There's no substitute for hands-on experience."

Leon Montgomery, professor of information services and telecommunications at the University of Pittsburgh, said schools with telecommunications degree programs or six to eight telecommunications courses can participate in TERN.

Those schools can use TERN for academic and research purposes. An institution could use the net to conduct lab exercises for students as well as research on the performance of new vendor products before they are commercially available.

TERN differs from existing education and research nets, such as the National Science Foundation Network and the Internet, because it is designed for experimental use.

"We may, for example, choose as part of an exercise to bring the entire network down and let the students isolate the problem, take corrective action and bring the network back up," Sobczak said. "You won't see that anywhere else." □

## Bell Atlantic to sell frame relay

continued from page 4

All seven RBHCs, GTE Telephone Co. and two independents — Cincinnati Bell, Inc. Telephone and Southern New England Telephone Co. — plan to jointly announce support for frame relay at a press conference held simultaneously at INTEROP and the International Communications Association's (ICA) annual conference in Atlanta.

However, it is unclear whether all the carriers will announce firm plans to offer the service or offer a statement of interest. Besides Bell Atlantic, four other RBHCs plan to roll out SMDS.

By committing to both frame relay and SMDS, Bell Atlantic hopes to stay above the fray that has pitted supporters of both services in bitter battles over which will reign supreme.

Mara Spaulder, manager of new product development at Bell Atlantic, said that by offering a full range of data services — including Fiber Distributed Data Interface, packet switching and private lines — the carrier can fill customer needs, no matter which technology is required.

Bell Atlantic is talking to long-distance carriers about trialing links between its frame relay and SMDS offerings with services from those firms.

To date, no long-distance carrier has announced a specific date to roll out SMDS, although AT&T — and perhaps MCI Communications Corp. — are expected to announce the service at the ICA show, with availability expected by year end ("AT&T, MCI prepare to launch SMDS," NW, March 30). All the major long-

distance carriers have rolled out a frame relay service.

Although local and long-distance carriers have yet to try linking SMDS and frame relay nets, Spaulder and other experts say that such cooperation is critical to the services' success. She added that one of the current holdups is the lack of equipment and standards for such connections.

One reason Bell Atlantic can afford to throw its support behind both frame relay and SDMS is that it plans to offer both services on the same switching platform. The company is using the cell relay Metropolitan Area Network Switch from Siemens Stromberg-Carlson. Frame relay packets will be encapsulated and carried in cells across the network.


Bell Atlantic currently offers its scaled-down SMDS service in Philadelphia and Pittsburgh. It will roll out full SMDS service in June and add Washington, D.C. and northern New Jersey to its service area. Spaulder said it is likely the carrier will initially roll out frame relay to the same areas.

In mid-1993, Bell Atlantic plans to offer an enhanced SMDS service with such features as 34M bit/sec access, multiple billing options and long-distance links.

The carrier also offers other data services, including Integrated Services Digital Network, switched 56K bit/sec, private-line offerings and a service that supports the 100M bit/sec FDDI standard, which is offered on an individual case basis.

Spaulder said Bell Atlantic will offer whatever services and features are available to meet customers' data needs. Also, she envisions the carrier's network migrating to Asynchronous Transfer Mode in the future. □





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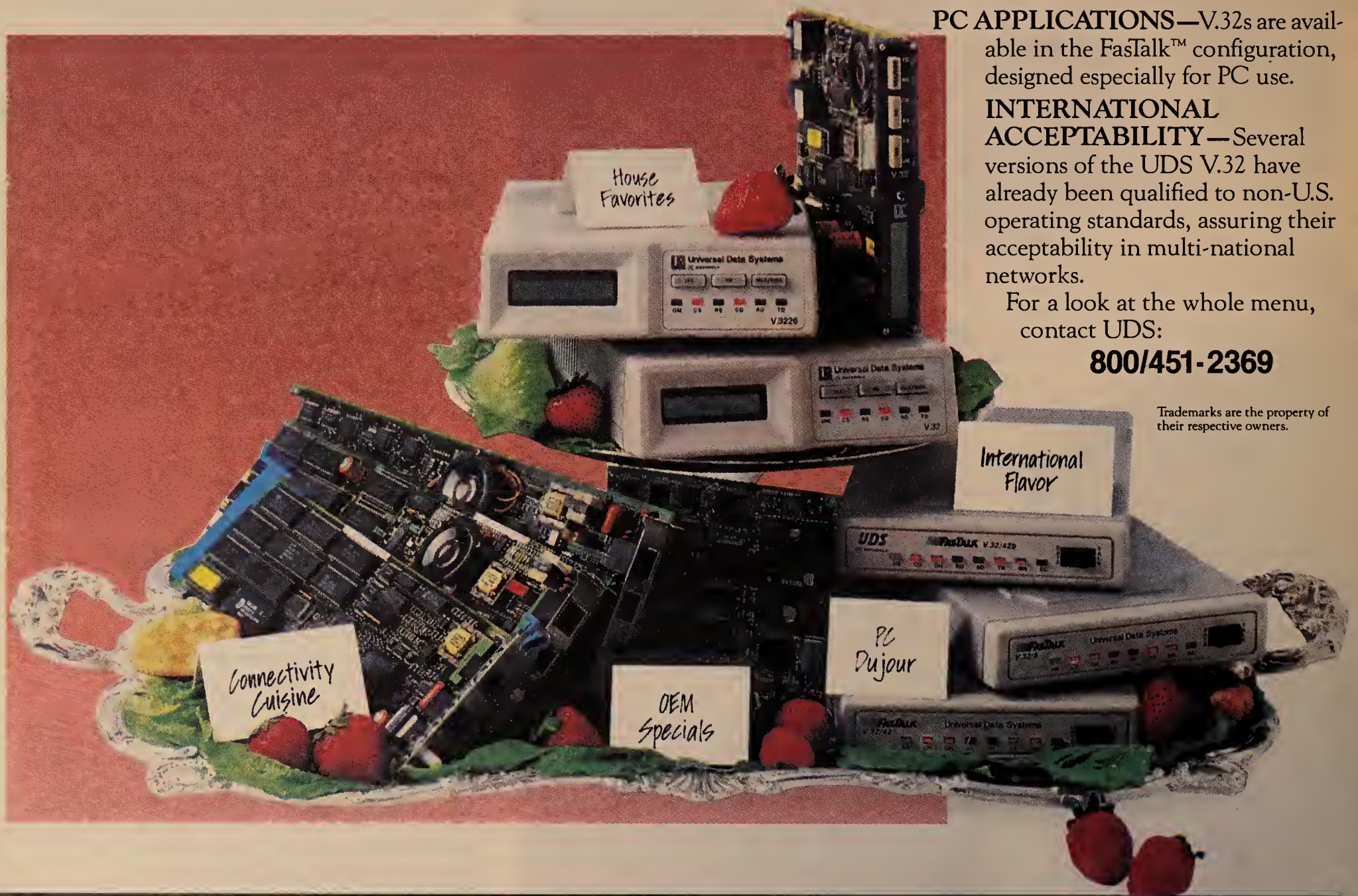
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## Worth Noting

**“T**he simple truth is very few sites are running OSI services in any significant fashion. The bulk of the market continues to use feature-rich architectures like SNA, DECnet and TCP/IP.”

**Jim Antonucci**  
Vice-president of marketing  
Forest Computer, Inc.  
Okemos, Mich.

## Data Packets

**U.S. Robotics, Inc.** rolled out a hub for accessing digital and analog network services.

The network access server (NAS) is a hardware chassis that integrates modems, token-ring, Ethernet, T-1 and Integrated Services Digital Network interfaces, as well as bridges, routers and gateways. NAS provides interconnectivity between local- and wide-area networks and telecommunications devices, and can be managed by Simple Network Management Protocol management systems.

NAS prices range from \$30,000 to \$60,000. It will be available in the first quarter of 1993.

**Dowty Communications, Inc.** was awarded a 10-year, \$50 million contract by the Federal Aviation Administration to provide communications processors for its Data Multiplexing Network.

The net distributes air traffic, weather and equipment maintenance information to all FAA facilities and other U.S. government agencies.

Dowty will supply the FAA with its DCX products, which integrate switching, bridging and gateway functions. **■**

## New software lets users downsize CICS applications

Packs let customers move traffic off mainframe.

By Michael Cooney  
Senior Editor

BILLERICA, Mass. — SNA users looking to downsize their CICS applications can look to new software from Integrigris, a systems integration subsidiary of Bull North America, Inc.

The new software — XPU4 and XPU5 — is designed to let users move some of their CICS applications off the mainframe, saving development time and mainframe cycles while reducing communications traffic.

XPU4 and XPU5 run on a Sun Microsystems, Inc. scalable processor architecture (SPARC)-based Unix box with Integrigris' UniKix software, which allows users to run CICS applications on Unix platforms. XPU4 and XPU5 emulate subsets of IBM front-end processor and mainframe communications sessions — PU Types 4 and 5, respectively — in Systems Network Architecture parlance. The combination of UniKix and the PU 4/PU 5 emulation capability will let users run and develop CICS applications on Unix machines, Integrigris said.

The company licensed the PU 4/PU 5 emulation product from Brixton Systems, Inc., which specializes in integrating Unix and IBM SNA environments.

“Typical 3090 mainframe

shops have 10 to 15 CICS applications running on a given mainframe,” said David Matthews, vice-president of downsizing at Integrigris. “If users reach capacity, they can move a couple of CICS applications down to our platform, rather than buy more memory or another mainframe.”

The limit to how many CICS applications can be supported depends on the size of the SPARC machine, Thomas said.

Integrigris said it expects that 30% to 40% of IBM CICS users will have a Unix migration strategy by 1994. A 1991 International Data Corp. market survey showed that 21% of CICS users were considering a Unix strategy.

Analysts said the new product will serve a niche in the downsizing marketplace but will be more useful as a tool for Integrigris to sell to other vendors.

“It is a systems integration tool, but the company is also looking to get software developers and hardware vendors to use it,” said Bonnie Digrius, a program director with Gartner Group, Inc. in Santa Clara, Calif.

The XPU4 product is available now, while the XPU5 software will be available in June. Both will cost \$800 for an eight-user system. UniKix costs \$8,800 for an eight-user system. **■**

## Modem pace edging up ever higher

By Bob Brown  
Senior Editor

LARGO, Fla. — The modem market's growth may be slowing, but the devices themselves keep getting faster.

AT&T Paradyne has announced it has enhanced the data compression capabilities of its software-defined Comsphere 3800 Series modems so they can now transmit asynchronous data at up to 115.2K bit/sec. The modems, which will remain at 14.4K bit/sec for synchronous communications, will support the forthcoming CCITT V.fast standard

once it is finalized, said a product manager for the company.

Motorola Codex and Telebit Corp. also have rolled out high-speed modems in recent weeks.

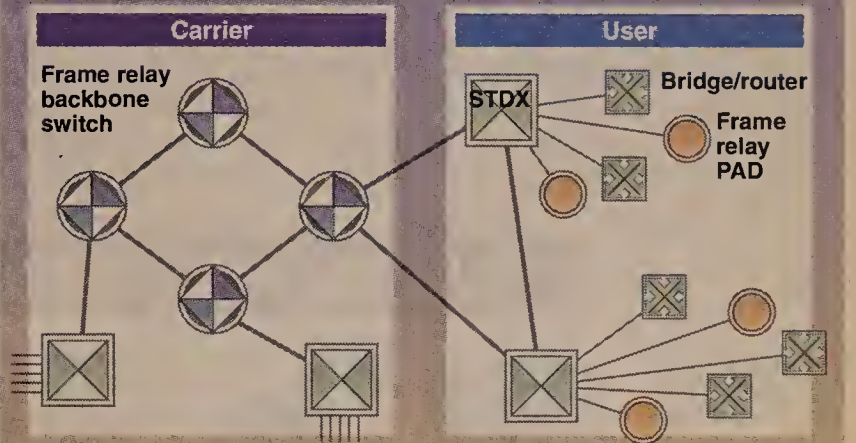
Motorola Codex announced its 326XFAST modems, while Telebit enhanced its V.32bis dial-up WorldBlazer modem to support throughput up to 70K bit/sec.

Vendors, including AT&T Paradyne and Motorola Codex, are rolling out higher speed modems even before the proposed CCITT V.fast standard for synchronous modulation and data compression is finalized. They are doing so to improve emerging high-speed applications, such as imaging and video, as soon as possible.

“The vendors are prolonging the inevitable migration to digital,” said Curtis Price, an analyst at International Data Corp., a

(continued on page 14)

## Cascade covers public/private frame relay nets



Cascade's STDX line of frame relay switches will let carriers extend the reach of their frame relay backbones to smaller sites and allow users to concentrate frame relay traffic from various frame relay access devices.

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: CASCADE COMMUNICATIONS CORP., WESTFORD, MASS.

## Start-up rolls out frame relay switches

Cascade's RISC-based switches support LAN internetworking over private, public networks.

By Bob Brown  
Senior Editor

WESTFORD, Mass. — Start-up Cascade Communications Corp. last week unveiled a line of RISC-powered frame relay switches designed to support LAN internetworking over both private and public networks.

Initially, Cascade will position the STDX switches as feeder devices designed to let carriers extend their frame relay nets to smaller central offices, where the deployment of higher end switches cannot be cost-justified.

The STDX switches are also designed to let users build private frame relay nets, though Cascade officials said the carrier market promises to ramp up more quickly. Several users are testing the equipment; however, Cascade officials declined to name them.

Cascade, unlike multiplexer and packet switch vendors that have begun addressing the frame relay market, built its switches from the ground up to support frame relay, said Bill Mitchell, Cascade's director of marketing. The switches boast advanced congestion control not found in other switches and support the major international frame relay standards.

Cascade's product rollout consists of two switches, two I/O modules and a network management software package, all of which will be available in June.

The two frame relay switches are the three-slot STDX 3000 and

six-slot STDX 6000. Each has an 800M bit/sec backplane to eventually support frame relay and higher speed technologies, such as Asynchronous Transfer Mode.

Based on Intel Corp. i960 Reduced Instruction Set Computing processors, the STDX devices boast throughput of 24,000 packet/sec. For non-frame relay traffic, such as X.25 and IBM Systems Network Architecture data, the STDX serves as a frame relay packet assembler/disassembler.

Among the key features of the Cascade STDX is the switch's rate monitor, which tracks the amount of incoming traffic on each permanent virtual circuit (PVC). The information is used by the switch to dynamically adjust for congestion.

Rate monitor data can also be used by carriers to notify users when they should adjust their committed information rate (CIR), the minimum amount of bandwidth guaranteed to the user. Private net users can take advantage of the capability to monitor and manage network usage, as well.

“Our rate monitoring capabilities tell the carriers exactly what kinds of circuits their customers need,” Mitchell said. “Users can then optimize their networks based on their real transmission requirements.”

The switches are designed to label data packets according to the PVC for which each is headed,

(continued on page 14)



## Start-up rolls out frame relay switches

*continued from page 13*

Mitchell said. Traffic being sent at a rate within the user's CIR always goes straight through. Traffic bursting above the CIR may be stored in a buffer if it cannot be accommodated immediately, but the Cascade switches are designed to pump that data through the net as soon as space is available, he added.

Mitchell said Cascade fills up empty space on a PVC with extra traffic just like an

airline fills up extra seats on a plane with standby passengers. Other frame relay switch makers, such as StrataCom, Inc., "don't allow these standby passengers on the plane, even if there are seats available," he said.

The switches are designed to house two varieties of hot-swappable I/O modules. One of them — the 24 Bundled T-1 Module — features a data service unit/channel service unit and provides 24 64K bit/sec channels on the carrier side of the net.

The six-port V.35 I/O Module transmits data at rates from 9.6K bit/sec to 4.096M

bit/sec on the local side of the network. The high-speed links can be used to connect STDx switches to one another or to feed data to a mux in a user's private T-3 network, for example.

Cascade's CascadeView Network Management Station is a software package that enables users and carriers to manage their STDx switches and keep track of network traffic based on information collected by the rate monitor. The management software runs on Intel 80386-based personal computers running Hewlett-Packard Co.'s OpenView network management platform.

CascadeView is also compatible with the Simple Network Management Protocol standard, supporting the SNMP Management Information Base (MIB) II and Cascade's extended MIB.

The STDx 3000 is priced at \$12,000, while the STDx 6000 is priced at \$15,000. The 24 Bundle T-1 I/O Modules cost \$5,000 each, and the six-port V.35 I/O Modules cost \$4,000 apiece. The price of the switches and cards combined ranges from \$16,000 to about \$42,000.

The CascadeView Network Management Station software is priced at \$2,000.

WilTel, a Tulsa, Okla., carrier that has served as a beta site for the switches, recently certified the devices to work with its WilPak frame relay service.

According to Chris Heckart, a product manager at WilTel, the carrier will probably buy at least one Cascade switch for its network. However, WilTel is still evaluating whether it should extend its StrataCom switch-based frame relay net with Cascade switches. It may prove more economical for the carrier to back-haul users to the StrataCom switches, she said.

But Heckart was impressed with the Cascade switches and said they "will allow users to more cost-effectively take advantage of public frame relay" by deploying the switches in their own nets.

She described one typical network scenario in which the net manager ties 20 sites using low-end routers or frame relay access devices into a Cascade switch, which then feeds into a public frame relay network. This would enable the user to do without a multiport router, which can cost more than \$60,000, and avoid providing each of the 20 sites its own link into the frame relay net, Heckart said.

Rick Malone, a principal at Vertical Systems Group, a Dedham, Mass., consulting firm, said Cascade's switches will serve "a wide-open market" for backbone devices designed to link users' LAN internetworks.

"We see a lot of users looking for a higher level backbone that they could implement to minimize the number of hops on their LAN internets and thereby improve the performance of the network," Malone said. "This is where the Cascade box would fit in quite well." □

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## Modem pace edging up ever higher

*continued from page 13*

Framingham, Mass., market research firm. "Even with the declining tariffs, the new higher speeds are encouraging users to stay with modems a little longer."

AT&T Paradyne not only hiked its modem speeds, it lowered prices. The company slashed the price of its two-/four-wire leased-line and dial-up Comsphere 3810 modem from \$1,595 to \$1,195, a 25% cut; its two-/four-wire leased-line and dial-up Comsphere 3811 modem card from \$1,495 to \$1,195, a 20% drop; and its dial-up and two-wire leased-line Comsphere 3820 from \$1,395 to \$995, a 29% drop.

AT&T Paradyne also introduced a new V.32bis modem dubbed the Comsphere 3830, priced at \$795. The modem, which supports asynchronous speeds up to 115.2K bit/sec and synchronous communications at 14.4K bit/sec, supports two-wire leased lines and dial-up lines. □



# LOCAL NETWORKING

LAN HARDWARE, NETWORK OPERATING SYSTEMS AND LAN MANAGEMENT

## Worth Noting

**B**y the end of the year, IBM will offer multiprocessing capabilities and up to 1.7G bytes of direct-access storage on its Personal System/2 Model 95 machines, according to David Hauger, product manager at IBM's Network Server Product Entry Systems Division in Boca Raton, Fla.

## Netnotes

**Epoch Systems, Inc.** last week rolled out two Unix-based backup products, EpochBackup and the Epoch-2 Data Server.

EpochBackup is a personal computer-based application that automatically backs up and restores files throughout a heterogeneous Unix-based network to an Epoch or Epoch-compatible server.

According to the Westborough, Mass., firm, the product is unique in that it offers features such as automatic error recovery, which lets the application automatically recover and continue backing up the network after a crash.

The Epoch-2 Data Server is a hardware/software backup system that provides a backup application, magnetic disks, optical disks and tape reboots or jukeboxes, all controlled by a Sun Microsystems, Inc. SPARCstation2.

The Epoch-2 Data Server is designed to handle the data management needs of large networks, as it can scale to support up to hundreds of gigabytes of on-line storage.

EpochBackup costs \$5,000 and will be available by mid-summer. The Epoch-2 Data Server is available now and is priced at \$93,900. **Z**

## Unisys reaches for PC LAN mart with new Unix server

Top-of-the-line servers also receive enhancements.

By Margie Wylie  
Senior Editor

**SAN FRANCISCO** — Like other server makers, Unisys Corp. is keeping its eye on a sought-after prize: the mid-priced, high-volume server personal computer market. To that end, the company has introduced a low-end Unix-based server tailored to the needs of PC LANs.

Starting at \$8,700, the U 6000/15 is based on Intel Corp.'s 486 CPU running at 33 MHz and can accommodate as many as 16 users, according to Unisys. The server runs the Unisys System V operating system, which complies with Unix Systems Laboratories, Inc.'s Unix System V Release 4.

The server also ships with Transmission Control Protocol/

Internet Protocol support, Network File System server software and its own graphical user interface based on the X Window System and the Open Software Foundation, Inc.'s Motif.

Users can buy add-ons, called Value Added Platform (VAP) software, for the server that provide additional features such as terminal emulation, databases, local-area network connections and development environments. For example, Novell, Inc.'s NetWare for Unix and Microsoft Corp.'s LAN Manager/X are available in VAP software.

Unisys also offers its own Open/OLTP software, an on-line transaction processing development environment, as VAP software. Open/OLTP includes gate-  
*(continued on page 16)*

## Tricord to deliver VINES superservers

By Caryn Gillooly  
Senior Editor

**MINNEAPOLIS** — Tricord Systems, Inc. has forged further into the superserver market with the release of four new servers designed to run Banyan Systems, Inc.'s VINES network operating system as well as two other high-end servers.

Two of the PowerFrame superservers are the first VINES servers Tricord has offered that take advantage of Intel Corp.'s new 50-MHz i486 microprocessor. The firm also unveiled a management console for centralized control of Novell, Inc. NetWare servers.

The VINES servers are the Model 30/25EB, an entry-level system with a 25-MHz i486 processor; the 30/33CB, with a 33-MHz i486 processor; and the 30/50CB and 40/50CB, each of which houses the 50-MHz i486 processor. All four servers come with 16M bytes of main memory, and the three higher end systems come with 256K bytes of second-level cache memory.

In addition, Tricord rolled out the PowerFrame Models 30/50C

and 40/50C for NetWare, Unix and Microsoft Corp. LAN Manager networks. These are also configured with the 50-MHz i486 processor and 256K bytes of on-board cache memory.

Tricord, based here, announced that existing PowerFrames are field-upgradable to the new 50-MHz processors for increased performance.

The company's new PowerSentry net management console, designed for NetWare 3.X networks, includes a board that plugs into a PowerFrame server and accompanying software.

The PowerSentry console, based on Microsoft Windows 3.0, provides network statistics and information on local-area network performance, resource allocation and physical component status via administrator-defined thresholds.

Using an internal modem, PowerSentry lets an administrator remotely access the console to alter parameters or reboot the system.

For VINES-specific machines, prices start at \$17,450 for the 30/25EB, \$24,490 for the 30/33CB, \$27,490 for the 30/50CB and \$33,490 for the 40/50CB. The 30/50C and 40/50C models cost an additional \$500 compared to the VINES-based versions. The PowerSentry console costs \$2,995. All products are available now. **Z**

"In my mind, multiprocessing — or lack of multiprocessing — is the biggest issue today in downsizing large-scale applications to client/server technology."

Paul Bandrowski  
Technology manager  
Sara Lee Corp.



## Multiprocessing: a must for downsizing

Technology might be an essential piece of the puzzle, but analysts say users simply aren't ready.

By Caryn Gillooly  
Senior Editor

With the slow but inevitable shift toward client/server computing, the issue of multiprocessing will undoubtedly move into the networking picture, as well.

Users and analysts agree that multiprocessing is a necessary step toward true client/server networking, but they disagree on just how important it is in current networking strategies.

Some customers even question whether a local-area network operating system can successfully support mission-critical applications being moved from mainframes and minicomputers down to LAN environments without multiprocessing capabilities.

"In my mind, multiprocessing — or the lack of multiprocessing — is the biggest issue today in downsizing large-scale applications to client/server technology," said Paul Bandrowski, technology manager at Sara Lee Corp. in Chicago. "If we're going to put our mission-critical applications on a LAN, that LAN has to be just as mission-critical."

Analysts, however, said they do not see customers maxing out their current resources to the point where multiprocessing is necessary.

In the truest sense, multiprocessing technology involves network operating systems capable of exploiting multiple microprocessors in a high-powered LAN server.

Traditional net operating systems, in contrast, are designed to run on single-processor personal

computer-based platforms.

The need for additional LAN server power has given rise to both asymmetric and symmetric multiprocessing.

With asymmetric multiprocessing, one processor acts as the master CPU while the other processors act as slaves, performing compute tasks assigned by the master. While this improves performance by splitting up tasks among processors, each CPU is task-specific, so some may sit idle while others carry the load.

With symmetric multiprocessing, all of a server's processors have access to the system kernel and can perform compute or I/O tasks simultaneously. Therefore, all types of tasks are evenly distributed.

Today, however, few companies offer either form of multiprocessing because the capabilities must be inherent in the hardware, operating system and application, according to Bandrowski.

That creates a chicken-and-egg problem: Multiprocessing capabilities are not widely available in any of the three camps, meaning there is little incentive for one sector to push the technology.

Perhaps more importantly, only the industry's most cutting-edge companies require multiprocessing technology; the majority of users are tackling different problems.

However, according to Bandrowski, multiprocessing in LAN environments is a necessity because many of today's high-end  
*(continued on page 16)*



## Multiprocessing: a downsizing must

*continued from page 15*  
applications can top out single-processor machines.

"Relational databases, manufacturing applications, accounting applications — these all have very high levels of transactions," Bandrowski said. "A payroll system for 500 people has to be very high performance. As we grow our LANs, we need more horsepower."

The answer, he continued, is not to sim-

ply wait for the next Intel Corp. X86 processor and move the application to a more powerful machine, but to build an environment that is vertically scalable. This means the customer should be able to grow an application on existing hardware simply by adding processors and I/O cards when the application needs more power.

In contrast, companies today offer horizontal scalability. "Horizontal scalability means that when one box tops out, you just put another box next to it," Bandrowski said. That is inefficient in both implementation and cost because customers are buy-

ing an entirely new machine when they only need an additional processor, he added.

Analysts generally agreed. "Multiprocessing truly is one important component in downsizing," said Cheryl Currid, president of Currid & Co., a Houston-based consulting firm. "You can't get huge applications down without it."

Network operating system companies, such as Banyan Systems, Inc. and Novell, Inc. also agree. Banyan offers multiprocessing capabilities, and Novell has said publicly it plans to include multiprocess-

ing capabilities in its core NetWare network operating system. Microsoft Corp. has not made a commitment.

### The downside

Currid pointed out, however, that Sara Lee is at the forefront of technology and questioned whether other companies would require as much raw power.

"It sounds to me like [Sara Lee is] running larger applications than the average bear," she said. "A vast majority of companies I talk to are not putting the big kahuna applications on their LANs just yet."

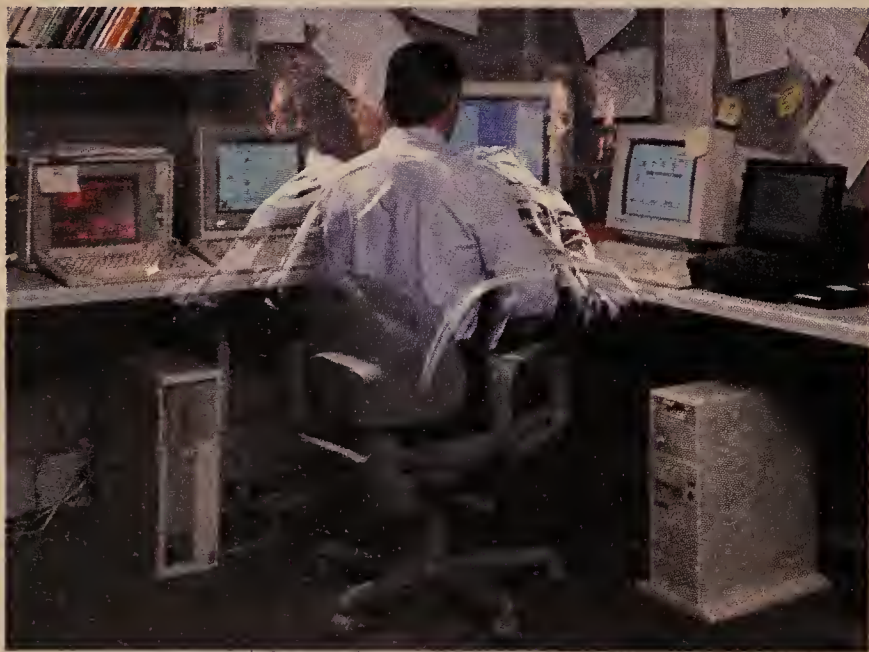
Other users agreed. "It would be nice to off-load some of the transactions to another processor, but right now, the choke point on our system is the wire," said Greg Scott, computing services manager for the College of Business at Oregon State University in Corvallis.

Scott, who closely monitors performance on the campus network, said, "For the most part, the server is loafing. It's the wire that's fairly busy."

According to analysts, it is problems similar to Scott's that vendors such as Novell are trying to solve, forcing more cutting-edge technology, such as multiprocessing, to the back burner.

"In the future, we'll have multiprocessing in the core operating system — that has been our statement of direction, so customers know where we're headed," said John Edwards, formerly vice-president of marketing at Novell. "But for now, we're focusing on [things such as] increasing network I/O." □

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## Unisys reaches for PC LAN mart

*continued from page 15*

ways that let developers build applications that integrate with IBM and Unisys mainframes, according to the company.

Expandable to 32M bytes of random-access memory, the U 6000/15 supports from 168M to 680M bytes of internal disk storage as well as an optional Weitek Corp. 4167 floating point math coprocessor.

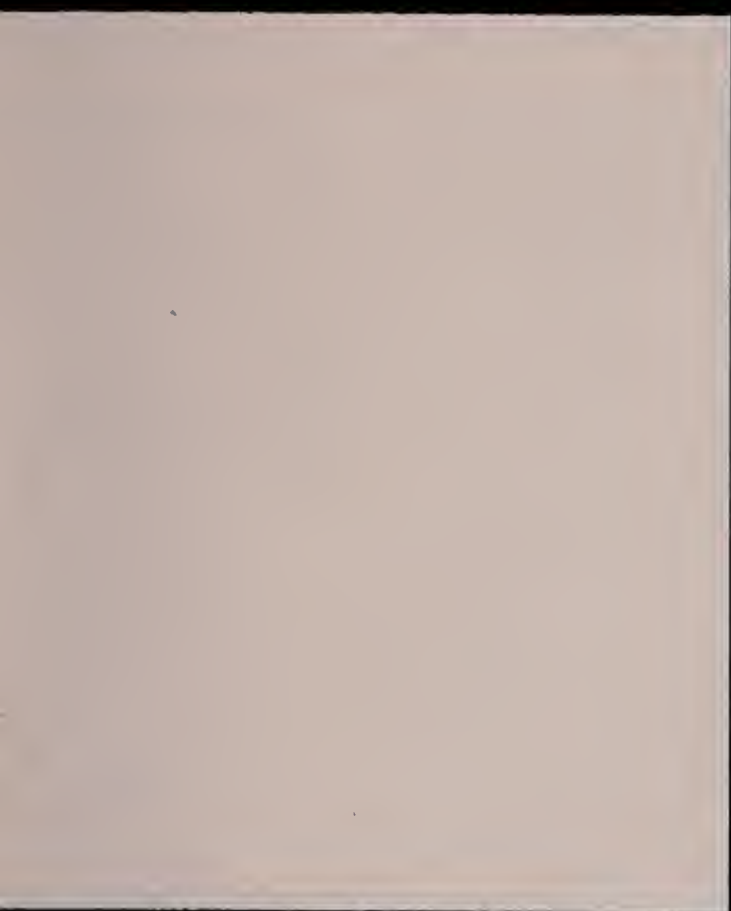
### Other improvements

Unisys also announced improvements to its high-end U 6000/75 and U 6000/85 multiprocessor servers. The firm said it has upgraded from the 25-MHz CPUs it previously shipped with the servers to dual 50-MHz 486 CPUs. The firm is also shipping new memory boards, including a 64M-byte controller, as well as 96M- and 192M-byte expansion boards. Based on 4M bit/sec memory technology, the new boards boost the U 6000/75's maximum memory capacity from 128M to 512M bytes, while the U 6000/85's maximum capacity, formerly 384M bytes, is now 960M bytes.

Unisys also increased fixed storage capacity, access speed and the total number of channels for the servers through its Quad Channel SCSI Controller interfaces. The U 6000/75 now offers 134G bytes of disk space and 16 channels. The U 6000/85 offers up to 260G bytes of disk space via 32 channels.

Pricing for the U 6000/75, which supports as many as 400 users, starts at \$109,765, and costs for the U 6000/85, which supports up to 1,000 users, start at \$348,234. □











# INTERNETWORKS

LAN-TO-LAN AND LAN-TO-WAN EQUIPMENT AND STRATEGIES

## Worth Noting

According to a recent survey of the 1,000 largest U.S. companies by Forrester Research Inc., 44% of users want a comprehensive system that combines bridging and routing into a single managed hub.

## Link Notes

IMC Networks Corp. will introduce at INTEROP 92 Spring the TP Hub/64, an eight-slot 10Base-T twisted-pair Ethernet hub with built-in repeaters.

Each slot holds an eight-port RJ-45 interface card, enabling the hub to support as many as 64 microcomputers with 10Base-T adapters. One slot is also equipped with an attachment unit interface/BNC port to allow connections to thick or thin coaxial-based Ethernet local-area networks. TP Hub/64 is equipped with RS-232 and RS-485 ports for linking a personal computer running IMC's EtherScan Hub Management software. The TP Hub/64 is scheduled to ship this quarter. Pricing has not been set but will be less than \$50 per port, IMC said.

As expected, SynOptics Communications, Inc. last week announced significant price reductions across the board on existing token-ring products in conjunction with the introduction of its new work group hubs and high-performance local bridges ("SynOptics to unveil suite of token-ring products, NW, May 4). For example, the 3000-04 modular enterprise hub was reduced to \$2,695, a 23% cut, while the 3505A host module, which features active per-port retiming, was reduced by 14% to \$1,795. ■

## Micom bridge to support fax, voice and LAN traffic

NetRunner squeezes traffic onto single leased line.

By Maureen Molloy  
Senior Writer

SIMI VALLEY, Calif. — Micom Communications Corp. will announce next week at INTEROP 92 Spring a remote Ethernet bridge that will simultaneously carry voice and facsimile traffic over low-speed leased lines.

With the new NetRunner, users at remote sites that previously employed separate dial-up lines to transmit voice and fax traffic to a central site can now squeeze that traffic together with bridged local-area network data over a single leased line, obviating the need for costly parallel lines.

NetRunner can transmit both synchronous and asynchronous traffic via the vendor's Rapid Relay technology, which is a combination of fast packet multiplexing, voice and data compression, and fax demodulation.

NetRunner consists of three

modules that support six 16K bit/sec voice/fax channels or 36 local data ports operating at up to 38.4K bit/sec for asynchronous traffic and 56K bit/sec for synchronous traffic. It also includes a bridging module with five additional data ports plus a wide-area port that operates at the same speed as the local data ports.

The bandwidth-on-demand and data compression capabilities in NetRunner enable users to make more efficient use of wide-area links than with time-division multiplexer-based devices.

Kenneth Guy, Micom's vice-president of corporate strategy and business development, said the device's data compression capability will nearly double the effective capacity of a leased line. Likewise, voice compression lets users combine digitized speech with bridged LAN traffic without

(continued on page 18)

## Synernetics inks OEM deal for 3Com bridge/routers

By Maureen Molloy  
Senior Writer

NORTH BILLERICA, Mass. — To complement its existing LANplex 5000 switching hubs, Synernetics, Inc. has announced a line of high-end stand-alone bridge/routers.

The Interplex 800 family of bridge/routers are being made available to Synernetics through an OEM agreement with 3Com Corp. Synernetics said it also plans to integrate the bridge/routers into its LANplex 5000 hub, which links Ethernet and Fiber Distributed Data Interface local-area networks and also acts as an FDDI concentrator.

The bridge/routers combine a Reduced Instruction Set Computing processor and custom-designed application-specific integrated circuits (ASIC) with an 800M bit/sec backplane to provide the throughput needed for high-speed network interfaces such as FDDI and T-3.

ASIC technology enhances performance by "shrinking" discrete components of the device into a single compact chip, there-

by enabling packets to traverse the bridge/router more quickly.

The bridge/router will initially be available in two models: a four-port version that will support two Ethernet and two wide-area connections, and an eight-port version that will support any combination of Ethernet and

Synernetics said it also plans to integrate the bridge/routers into its LANplex 5000 hub.



FDDI LANs and wide-area interfaces.

Both bridge/router models support wide-area links at speeds up to T-1, as well as X.25, frame relay and Switched Multimegabit Data Services interfaces.

Synernetics said future re-

(continued on page 18)

## Hub feature forecast

Feature	Cabletron Systems, Inc.	SynOptics Communications, Inc.
ATM support	Future	Future
Dedicated bandwidth to the desktop	Future	1992 to 1993
Bridge/router support	Current	Current, with future Reduced Instruction Set Computing-based offerings
Network management features	Unbundling Spectrum, opening up to other developers through Partner's Program	More intelligence at the hub level, ability to set network policies
Security	Current: port locking; future: packet scrambling	Current
Per-port switching	Not planned	Planned
Long-term directions	File-server capability within hub by the end of last month	Naming services within hub, more net management focus

NETWORK WORLD

## Hub vendors vary in market strategies

SynOptics plans products with ATM in mind, while Cabletron takes a more cautious approach.

Last of a two-part series examining hub vendor strategies.

By Joanne Cummings  
Senior Writer

While the plans of hub maker SynOptics Communications, Inc. are driven in part by the need to accommodate Asynchronous Transfer Mode (ATM) technology, Cabletron Systems, Inc. is more circumspect about the future.

SynOptics, like Ungermann-Bass, Inc. and 3Com Corp., sees ATM as an important emerging force ("Hub vendors ready transition to ATM," NW, May 4).

"As a company, we understand the significance of ATM," said Bill Lanfri, vice-president of marketing at SynOptics. "At the appropriate time, we'll do a good job of integrating it."

However, until then, SynOptics is looking at adding interim features, with added focus on network management.

"We're really focusing on trying to turn this network infrastructure into something that gets closer to managing itself and is capable of diagnosing its problems, repairing them and telling you what it did to fix them," Lanfri said.

SynOptics is working on an application it calls PolicyMan, which will enable a net adminis-

trator to set a policy for the network that would, for example, turn off certain hub ports at a specific time each night and turn them on again in the morning.

Also, SynOptics plans to offer software that will automate such tasks as processing alarms and traps before a notification is sent to the management station. "We are feeling very compelled by our customer base to continue delivering more value by making these hub networks more manageable and deployable," he said.

As far as a definite preparation for ATM, SynOptics is relying on its RUB System, a joint development program it entered into with Cisco Systems, Inc. last year. "We'll see something from that program in terms of an incremental [ATM] hub architecture in the 1993 time frame," Lanfri said but declined to be more specific.

SynOptics plans to offer per-port switching as well as Reduced Instruction Set Computing (RISC)-based bridges and routers within the hub sometime in 1992 to 1993, as well.

Cabletron is more of a fence sitter when it comes to ATM. "It's our view that [ATM] represents an opportunity for the future, but who knows what will show up in the next two years," said Chris Oliver, the firm's director of engineering and manufacturing.

(continued on page 18)



## Synernetics inks deal for bridge/routers

*continued from page 17*

leases of the bridge/routers will include support for token-ring LANs and T-3 interfaces. The company did not say when these interfaces will be available.

Pricing for the Interplex 800 routers vary, depending on configuration. For example, a configuration that supports one FDDI and two Ethernet networks costs \$17,950, while a full FDDI-to-FDDI configuration costs \$23,245. Both the four- and

the eight-port models are currently available.

Synernetics' plan to integrate the bridge/routers directly into the hub will expand the hub's capabilities to include multiprotocol routing of the Transmission Control Protocol/Internet Protocol, Digital Equipment Corp.'s DECnet, Novell, Inc.'s Internetwork Packet Exchange (IPX) and Xerox Corp.'s Xerox Network Systems.

Pricing and availability for the bridge/router modules has not yet been determined. ■

## Hub vendors vary in market strategies

*continued from page 17*

"We have some research activities in that area, but whether they result in products in the short term or the long term depends on a lot of issues, some of them customer-driven, some of them technology-driven," Oliver said.

The company does plan to offer preparatory features, such as dedicated bandwidth to the desktop, but offered no time frame or product plans. What Cabletron seems to be concentrating on is modifying

and enhancing today's technology.

Evidence of that strategy is the firm's recent unbundling of its Spectrum network management system and announcement of its Partner's Program ("Cabletron's Spectrum to go modular," *NW*, March 16). Cabletron is looking to leverage the various niche technologies of other network equipment vendors in order to broaden the scope of its net management system and gain the latest technologies, such as bridging and routing, for its hubs.

"We want to work with specialists such as Cisco for high-performance routing and Cayman [Systems, Inc.] for LocalTalk-to-Ethernet connectivity solutions," Oliver said.

**C**abletron is looking to leverage the various niche technologies of other vendors to broaden the scope of its net management system and gain the latest technologies.



As for running applications on the hub, the firm currently offers a Network File System (NFS) file server for the hub through an agreement with Silicon Graphics, Inc., according to Oliver.

That product is a RISC-based module that comes with a half-gigabyte of disk storage and enables users to integrate file-server, print-server or other server functionality directly into the secure hub environment, he said.

"There's an example of our continued direction where the customer says, 'Gee, the hub provides me with 80% of my solution. It would be nice to integrate the other 20% into the hub, as well.' We've done that in the past, and we'll do more of it in the future," he said. ■

## Micom's bridge to support fax, voice

*continued from page 17*

slowing internetwork performance. The device supports compressed voice rates ranging from 4.8K to 16K bit/sec. Although the device can support voice and fax traffic, it is unsuitable for real-time video and multimedia applications because of its relatively low speed line support.

NetRunner supports the Transmission Control Protocol/Internet Protocol, Apple Computer Inc.'s AppleTalk, Digital Equipment Corp.'s DECnet and Novell, Inc.'s Internetwork Packet Exchange (IPX). Other features include an on-board modem and a data service unit/channel service unit board option as well as built-in network management capabilities.

Pricing for NetRunner begins at \$3,500, with optional voice/fax channels starting at \$1,100. The product begins shipping next month. ■



## WHAT DID IT TAKE TO CHANGE THE LADY'S MIND?

The American Painted Lady is just one of the rare species to have chosen Ireland as a home from home.

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# GLOBAL SERVICES

DOMESTIC AND INTERNATIONAL VOICE/DATA SERVICES, ACCESS EQUIPMENT AND REGULATORY ISSUES

## Worth Noting

The market for public frame relay services will soar from \$36 million this year to \$1.15 billion in 1996, according to a recently released study by Vertical Systems Group, a Dedham, Mass., research firm.

## FTS 2000 users ask for improvements from AT&T

Calls for interoperability top most users' wish lists.

By Anita Taff  
Washington Bureau Chief

DENVER — Government users on AT&T's Federal Telecommunications System (FTS) 2000 network have handed the carrier a wish list of 225 service enhancements and other improvements they want to see this year.

About 430 attendants at AT&T's second annual users group meeting here came up with the recommendations during three days of work group sessions. The number of items requested is greater than the list given to AT&T last year, but some of the features are already in the planning stages or represent changes in the mechanics of the contract.

Although user needs vary by agency, the federal customers rallied around three major areas in which they hope to see improvement. Interoperability between the two FTS 2000 carriers' networks and non-government

networks topped many of the agencies lists.

A particularly important interoperability need is connection with the Internet, a worldwide network that links government users, universities and defense contractors. Users warned AT&T last week that if it does not offer such interoperability by the end of fiscal year 1992, it risks being bypassed.

"What we want [AT&T and the GSA] to understand is that we are going to have Internet access by the end of fiscal year 1992; we'd like to do it through FTS 2000," said Stephen Deep, telecommunications manager for the Department of Agriculture's Forest Service.

Another issue users identified as important was the need to add support for services such as fractional T-1 service and frame relay, which are not currently available through FTS 2000, and

(continued on page 20)

## Agencies concerned with FTS 2000's uncertainty

DENVER — Federal users of FTS 2000 gathered at a user group meeting here said competition between AT&T and Sprint Corp. to land larger portions of the government net contract for the next three years may result in confusion and disruption.

Under provisions of the Federal Telecommunications System 2000 contract, the two carriers must submit new prices in the fourth and seventh year of the 10-year, multibillion-dollar contract. In order to create maximum competition, the government may award up to 40% of one carrier's traffic to the other.

The problem is that 40% figure comprises users who are just now getting comfortable with FTS 2000 after a long, bumpy road. Most agencies have fully cut over to switched voice service under FTS 2000, and many are turning to more advanced services such as videoconferencing.

It isn't clear which criteria

will drive the General Services Administration, which oversees FTS 2000, to move traffic from one carrier to another.

William Cunnane, deputy associate administrator of the GSA, who attended the AT&T FTS 2000 user group meeting here, refused to discuss FTS 2000. However, a GSA spokesman said the agency will consider both price and quality of service in deciding whether to move traffic.

It is equally unclear what will happen to users if one carrier wins a significant amount of the other's traffic. The carriers have been asked to submit plans for moving users between networks, but no one knows what those plans entail.

Numerous users, including the outgoing and incoming president of the user group's executive steering committee, said government customers are worried about the rebid.

"I think people will be glad

(continued on page 20)

## Finding a niche for switched services

Number of hours switched services can be used before costs equal that of dedicated facilities.

Link speed (bit/sec)	Length (miles)	Hours (per day)
64K	100	1.53
	1,910	3.14
128K	100	1.37
	1,910	2.94
256K	100	1.30
	1,910	2.76
384K	100	1.22
	1,910	2.61
512K	100	1.15
	1,910	2.46
768K	100	0.99
	1,910	2.45

Figures are based on a comparison of AT&T's Accunet Switched Digital Services and fractional T-1 Accunet Spectrum of Digital Services over 20 8-hour workdays.

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: THE ARIES GROUP/MPSG, ROCKVILLE, MD.

## Switched digital data services gain respect

New offerings can represent an economically viable and more flexible alternative to dedicated lines.

By Bob Wallace  
Senior Editor

Widening availability of switched digital access services and growth in popularity of high-speed switched data services are upsetting some of the standard tenets of wide-area data network design.

Network managers who use dedicated access to switched long-haul services are now being advised by tariff analysts, carriers and telephone companies to make wider use of switched access.

And companies that employ leased lines to connect far-flung locations are beginning to find that switched dial-up circuits are often less expensive and more flexible.

"Users need to rethink the way they design data networks," said Daniel Briere, president of TeleChoice, Inc., a Montclair, N.J., consultancy. "They can use digital switched access and switched data services to save money, increase data network flexibility and better support many applications."

### Switched access

One piece of the network design puzzle that users need to reassess is use of dedicated local exchange access to switched long-haul services.

Michael Hills, president of HTL Telemanagement, Ltd., a Burtonsville, Md., firm that specializes in network design, said net managers should be making

far wider use of digital switched access.

"Most users think digital switched access is economical only [when you need less than] about a half an hour a day [of connect time], but closer examination shows that it can be less expensive for up to three hours a day," he said.

**"Users need to rethink the way they design data networks,"**  
Briere said.

▲▲▲

According to Hills, the typical cost of a dedicated line to an AT&T point of presence (POP) is \$292. He subtracted the typical cost of a premise-to-local exchange link — \$138 — from the \$292 and then divided the difference by the \$2.40 per hour cost of switched service. The result is that 64 hours per month of switched traffic equals the cost of a leased line.

This means switched access is less expensive than dedicated access if you are using the link for less than three hours a day, presuming a 20-business day work month.

Hills emphasized that the cost

(continued on page 21)



# AT&T service offers lifetime phone numbers

By Bob Wallace  
Senior Editor

NEW YORK — AT&T has announced a service that gives people on the move a lifetime telephone number and the ability to program the carrier's network to have calls forwarded as they move from location to location.

With the AT&T EasyReach 700 service, a first-of-its-kind offering, subscribers dial a 700 number, enter a four-digit personal identification number (PIN) and hit the pound key to reach a voice response unit in the AT&T net.

After selecting call forwarding from a menu of options, subscribers enter the number where they can be reached and the time at which they would like to begin receiving forwarded calls. Customers can instruct the system to forward all calls or just calls from people who have their own PIN.

AT&T's 5ESS central office switches pass the caller's number to a coresident database, which converts the 700 number to the new local number that the subscriber entered.

"The EasyReach 700 service is an example of how AT&T's Worldwide Intelli-

gent Network is getting even smarter," said Merrill Tutton, president of AT&T's consumer communications services unit. "Thanks to the technology of AT&T Bell Laboratories, the net will find you no matter where you go on the U.S. mainland and send you only those calls you want to receive."

AT&T said the EasyReach 700 service is primarily intended for "maxi-mobiles," individuals who don't want to miss calls as they travel from office to hotel or from car phones to weekend getaway spots. It will also be attractive to customers who relocate often. The carrier said the average U.S. resident moves 11 times in a lifetime.

Customers pay \$7 a month for the service and a \$25 onetime charge for the 700 number. They will even be able to select a vanity number, such as (700) CALLTOM, if the number is available.

EasyReach calls will be billed at fixed per-minute prices, regardless of distance. State-to state rates will be 25 cents per minute from 8 a.m. to 5 p.m. Monday through Friday and 15 cents per minute at all other times. Prices for in-state calls will vary by state.

AT&T has asked the Federal Communications Commission for approval to begin offering the service on June 15. Availability will depend on billing arrangements with local telephone companies and will vary around the country. For information about EasyReach, contact AT&T at (800) 222-0300. **■**

## FTS 2000 users ask for improvements

*continued from page 19*

improvements in videoconferencing and electronic mail.

The most complaints, however, were in support systems. Customers reported numerous problems with billing, order entry and delays in receiving service.

For example, Deep said that some users continue to receive bills after a service is disconnected. Linda Matthews Hood, communications manager for the Department of Commerce, said there have also been instances of telephone numbers billed to the wrong agency and that it takes two to six

months to have the number removed.

Additionally, users want better communications with AT&T. Hood pointed to one example in which AT&T knew a billing problem would prevent an agency from receiving a bill for an entire month but did not notify the agency in advance.

Despite the large number of requests submitted, most attendees at the conference said they are generally happy with the quality of service they get from FTS 2000. Attendees said they were impressed by the willingness of all parties — users, carriers and GSA personnel — to step up to the table and hammer out solutions.

Sandra Bates, manager of program support communications for the National

## Agencies concerned with FTS 2000

*continued from page 19*

when it's over so we can get on with our business and not be preoccupied with contractual matters," said Sandra Bates, manager of program support communications for the National Aeronautics and Space Administration and the incoming chairwoman of the executive committee. "[The rebid] makes people uneasy because there's nothing they can do about it."

The GSA-appointed Interagency Management Council, a group of 11 of AT&T's largest FTS 2000 users, will advise the GSA on moving customers between networks. But council members said they weren't

sure how the transition would work.

Some agencies may be affected more than others by a switch. Dennis Roth, FTS 2000 deputy program manager at AT&T, said that, in most cases, agencies will be able to keep their existing telephone number if switched between networks.

But questions linger about moving other services, especially 800, since those numbers cannot currently be switched among carriers due to technology limitations of the local carriers.

Also, some users said they believe the GSA will absorb all installation charges incurred during a changeover, but no official word is available yet.

Agencies that have moved rapidly to install advanced data and videoconferencing



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Start with 12 ports in a single LinkBuilder 10BT and keep building. You can connect four of them in all — up to 48 ports — and have them act as a single, logical repeater. Just like a chassis-based hub — without the cost.

Best of all, perhaps, you can turn an unmanaged stack of LinkBuilder 10BTs into a managed stack with astonishing ease.



Aeronautics and Space Administration and incoming president of the executive committee of the FTS 2000 users group, said she believes that past controversies and user reservations about FTS 2000 are disappearing. "I got the sense everybody really wants to make [FTS 2000] work," Bates said. "If it isn't meeting their requirements, they want to work to have it changed rather than get an exception [to purchase service elsewhere]. That's a big change from last year."

Bates credited AT&T for working hard to satisfy users for this turnaround. However, she added, there are still user concerns and "it's time to develop a plan and get on with it." ■

may be particularly hard hit because there is no interoperability between the two carriers' networks for most of those services. Agencies may have to scrap their nets.

However, Jim Dolezal, outgoing chairman of the executive steering committee and chief of the telecommunications systems division for the Department of Interior, downplayed those concerns. He said the rebid will be over by December, after which it will take a long time to design implementation plans and move customers.

That will come only if the GSA decides to move traffic between carriers, and Dolezal doubts that will happen. "There may be no shift in agencies. That's a very big possibility," he said.

— Anita Taff

## Switched digital data services gain respect

*continued from page 19*

of the premises-to-central office link ranges from \$50 to \$300, depending on the state and the local phone company that provides the link.

Mike Liebe, a program manager with Pacific Bell, said the crossover can be even higher.

"If a company uses our [leased digital

called an inverse multiplexer, higher capacity facilities. Inverse multiplexers accept high-capacity data feeds and dial up as many 64K bit/sec switched links as needed to form a single link to a remote location.

The cost of the inverse muxes has to be taken into account when evaluating the expense of using switched facilities as an al-

**T**he crossover point at which leased facilities become more economical than switched links varies by distance and capacity.



data service] for less than 6.79 hours a day, they should be using our Switched Digital Service 56," he said.

Analysts are quick to stress that digital switched access is less of a cost issue for large corporations because they tend to have channels on T-1 access pipes that they can use to access switched data services.

### WAN alternative

On the wide-area network side, switched 64K bit/sec data services can be used to replace dedicated 64K bit/sec facilities or, using a new breed of device

ternative to fractional T-1 links.

Rod Randall, a founder of Teleos Communications, Inc., a vendor of network access devices in Eatontown, N.J., said inverse multiplexers can range in price from \$6,000 for a baseline single-port unit to \$30,000 for a full-blown multipoint device. Most users buy the \$6,000 to \$12,000 units, he said.

According to The Aries Group/MPSG, a network design and consulting firm in Rockville, Md., the crossover point at which leased facilities become more economical than switched links varies by circuit distance and capacity (see

graphic, page 19).

A company, for example, needing a 100-mile, 64K bit/sec circuit more than 1.53 hours a day would be better off using a leased fractional T-1 service than a switched 64K bit/sec service. The crossover is at 3.14 hours a day for a 1,910-mile circuit.

Although fractional T-1 services may appear more attractive than switched 64 bit/sec services for users that need more than about three hours of daily connect time, switched services offer greater flexibility.

If a switched link to an AT&T POP is knocked out, the inverse multiplexer can quickly dial another carrier's POP, whereas if a leased line is knocked out, the user must wait for the carrier to restore or re-route traffic around the downed link.

Users can also play the field by programming the inverse multiplexer to use the carrier with the lowest switched services rates for daytime traffic and the one with the lowest night/weekend rates during those periods.

Joe Lueckenhoff, AT&T's Accunet Spectrum of Digital Services and Dataphone Digital Service product manager, said almost all AT&T customers use a mix of leased fractional T-1 service and switched 64 bit/sec service.

"Companies use fractional T-1 to [support] a steady flow of data throughout the day, week or month and bring in switched 64 bit/sec service to handle peak traffic loads," he said. ■

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# ENTERPRISE APPLICATIONS

CLIENT/SERVER AND ENABLING SOFTWARE: DISTRIBUTED DATABASE, MESSAGING, GROUPWARE AND IMAGING

## Worth Noting

“By adding new options in Version 3.2, such as protected mode, Novell is putting the trade-offs of running NetWare Loadable Module databases in the hands of users, which is ideal.”

**Jamie Lewis**  
Vice-president  
The Burton Group  
Salt Lake City  
Discussing Novell, Inc.'s response to the problems associated with running database NLMs

## Lotus introduces sample Notes applications on-line

Will aid users in building on groupware platform.

By Bob Brown  
Senior Editor

CAMBRIDGE, Mass. — Lotus Development Corp. recently introduced an on-line catalog of sample applications for Notes that is designed to help users and resellers build Notes applications easier and faster.

In a related announcement, Lotus announced it would support and distribute a third-party Systems Network Architecture Distribution Services (SNADS) gateway, providing a direct connection between its cc:Mail electronic mail product and IBM host environments (see “Lotus to unveil SNADS gateway for cc:Mail,” page 24).

Lotus's Notes Application Library is a collection of 50 applications designed to work in a cross section of user environments. The library, which includes meeting tracking and budget planning applications, will be distributed free of charge to Notes users, resellers and business partners.

The applications can be deployed by users as is or as starting points for building custom applications. Each comes with docu-

mentation that explains its purpose and a feature that enables managers to demonstrate the application to other users.

The library will help Lotus better explain to users exactly how they can use Notes, a product that Lotus officials said is so flexible that using it is difficult to describe. The library will also better enable the Notes project leader typically found at user sites to market Notes internally.

“The difficulty with Notes is describing it. Notes is much easier to show,” said Gary Banks, former director of the advanced technology group at Bristol-Myers Squibb Co. in New York, which has downloaded the Notes Application Library and has been looking through it for the past few weeks.

Lotus currently ships a handful of sample applications with Notes, yet users and resellers often question what Notes is, said Eric Sall, Lotus' director of product management for Notes.

“Sometimes when you have a very flexible product, it takes a while for people to understand (continued on page 24)

## Informix offers new front ends

By Timothy O'Brien  
West Coast Bureau Chief

MENLO PARK, Calif. — In response to customer demand for a more open client/server offering, Informix Software, Inc. announced that seven of the industry's most popular front-end tools will now be able to access Informix database servers.

Informix also announced immediate availability of new versions of its client software — Informix-ESQL/C, Informix-NET PC and Informix-SQL — that support Microsoft Corp.'s Windows, enabling new and existing Informix applications to run under the graphical user interface.

“This is a big step for Informix and is in direct response to enormous demand on the part of our

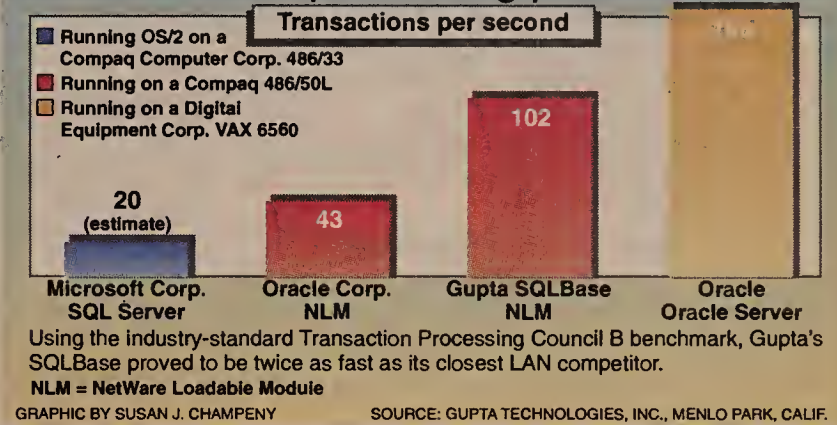
customers,” said Susan Nurse, senior market development manager for client/server products at Informix. “By supporting Windows, we give our users more choice on the tools they can use at the desktop.”

The personal computer-based front ends that Informix is supporting are Channel Computing, Inc.'s Forest & Trees, Gupta Technologies, Inc.'s SQLWindows, JYACC, Inc.'s JAM, Lotus Development Corp.'s 1-2-3 and Data Lens Drivers, Pioneer Software Systems, Inc.'s Q&E Database Library and Database Editor, Powersoft Corp.'s PowerBuilder and Uniface Corp.'s Uniface 4GL.

The PC tools work with Informix servers via Informix-ESQL/C and Informix-NET PC. Informix-ESQL/C enables developers to embed SQL commands into C source code. The package offers Windows and DOS support and allows developers to create applications that use dynamic link libraries or executable modules.

Informix-NET PC provides the (continued on page 24)

## Transaction processing performance



## Gupta ups ante with server performance

Using standard benchmark, firm shows SQLBase server more than doubles archrival's throughput.

By Timothy O'Brien  
West Coast Bureau Chief

MENLO PARK, Calif. — Gupta Technologies, Inc. last week raised the stakes in the LAN database market by announcing performance numbers for its SQLBase database server that are more than twice as high as those posted by archrival Oracle Corp. on a similar machine.

Using the industry-standard Transaction Processing Council B benchmark, Gupta achieved performance of 102 transactions per second (TPS), compared to less than 50 TPS for Oracle in the same configuration.

The benchmarks gave SQLBase an industry-leading price/performance cost rating of \$1,380 per TPS, a calculation comparing the cost of a database against its TPS performance.

“One hundred TPS is no mean feat. This will give Gupta legitimacy as a robust environment.”

Analysts said Gupta's impressive performance rating will give it more credibility with users looking for a powerful local-area network-based server engine.

“One hundred TPS is no mean feat. This will give Gupta legitimacy as a robust environment for larger applications and on-line transaction processing,” said

Thomas Willmott, vice-president of Aberdeen Group, Inc., a consulting firm in Boston. “They will have little competition, except for Oracle, and the numbers say a lot.”

The testing was conducted by Gupta, Novell, Inc. and Compaq

“Gupta will have little competition, except for Oracle,” Willmott said.

Computer Corp. at Compaq's headquarters in Houston. The Gupta SQLBase was installed as a NetWare Loadable Module (NLM) on a Compaq 486/50L Deskpro computer on a NetWare LAN.

The benchmark test employed a single, repeatable, update-intensive transaction. Throughput was measured subject to a “residence time constraint,” which dictates that 90% of transactions during a measurement interval must receive a response within two seconds of making a request.

In addition, the size of the tested database was increased as the transaction rate was increased. For example, a database performing at 100 TPS must contain twice as much data as one performing at 50 TPS.

In the Gupta benchmark that achieved 102 TPS, the database contained 10,200,000 records (continued on page 24)

## Store & Forward

Lotus Development Corp. has introduced Lotus Sound, sound annotation software that enables users to link or embed audio messages or music in business documents.

The Lotus Sound software works with applications running under Microsoft Corp. Windows and takes advantage of the Windows Object Linking and Embedding capability, which allows access to digitized sound files attached to an application.

The Lotus Sound User Interface is displayed on the screen as a small control box and enables users to click on icons to record, erase and play stored sound files. A volume slider gives control of the audio volume, while a level meter provides feedback about sound levels during recording and playback.

Since most personal computers are not yet equipped to handle sound, the recording and playback of sound files is accomplished using a microphone and speaker device that can be plugged into a PC. The firm plans to bundle Lotus (continued on page 24)



## Gupta ups ante with server performance

*continued from page 23*

comprising more than 2G bytes of data.

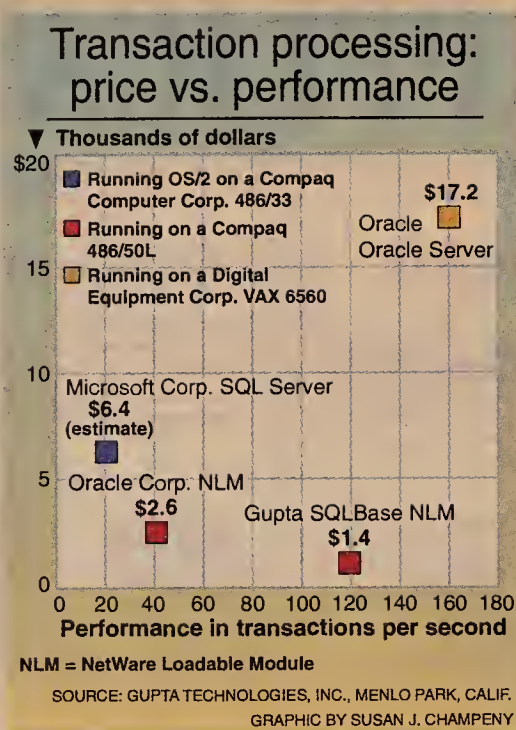
Up until now, database performance in excess of 100 TPS has only been achieved on minicomputers and mainframes. For example, according to figures published by the Transaction Performance Council, the Oracle Server achieved a 153 TPS rating on a Digital Equipment Corp. VAX 6560 computer with a total system cost of \$2.6 million and a price/performance rating of \$17,160 per TPS.

In a more direct comparison to Gupta's SQLBase on the NetWare platform, the NLM version of Oracle Server running the same tests on a Compaq 486/50L Deskpro computer achieved a 43 TPS rating at a cost of \$2,590 per TPS.

Gene Shklar, vice-president of marketing at Gupta, said the performance numbers are important to customers considering moving applications to LANs.

"Users are looking at the viability of running downsized, mission-critical applications on a database server," he said. "Gupta demonstrated that it was more than twice as fast as any competitor. We didn't win the speed race by a nose, we won by a couple of laps."

Although the performance results are significant, industry analysts question the viability of running databases as NLMs under NetWare. The popular operating system does not "protect" applications from

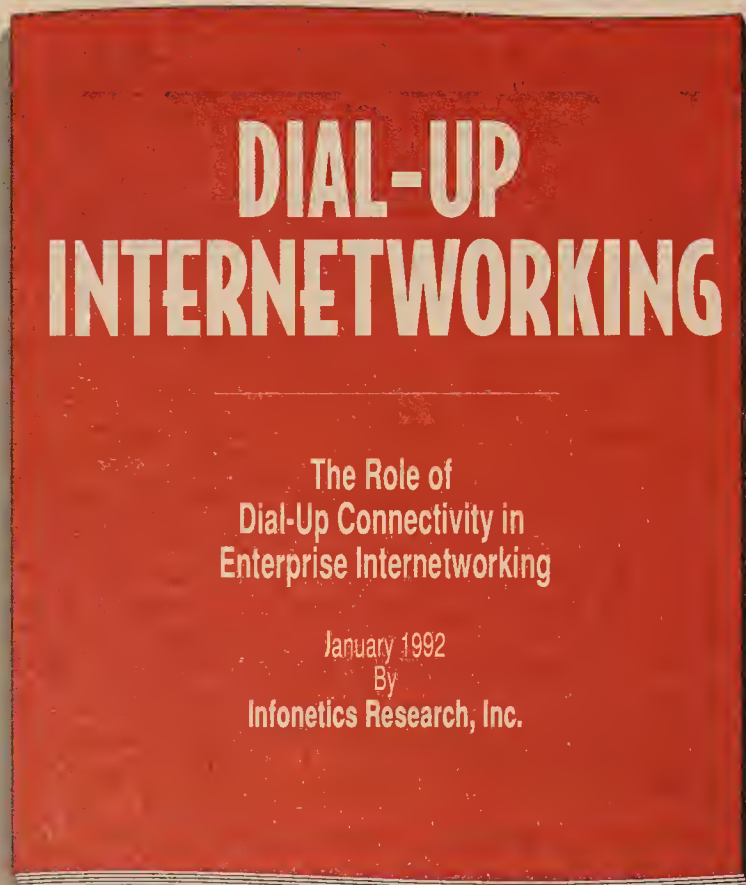


occupying the same memory space — which can cause a system crash — and doesn't provide rich processor scheduling functions or memory management.

Gupta overcomes some of these limitations by providing its own preemptive scheduler capability, which handles processor requests for multiple clients. SQLBase also bypasses Novell's standard memory caching routines and uses its own.

"Gupta was able to achieve these results because we architected SQLBase to be a high-performance, cost-effective client/server solution for the LAN environment," Shklar said. ■

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## Lotus intros sample Notes applications

*continued from page 23*

what should be done with it," Sall said. "Now we have 50 answers for them."

According to Sall, the library could help some Notes users get applications up and running in a matter of hours or even minutes, instead of weeks, which is what it typically took in the past.

Sall said he is hopeful that the library will spark new application ideas on the part of users and resellers. Lotus research has shown that once users know how to use Notes, its use "tends to explode" within the organization, he said.

The Notes Application Library, which could be expanded in the future, includes sales and marketing, human resources, finance, management, administration, engineering, general information and MIS applications, as well as several vertical market applications. Users can search the library by application subjects or by features.

One sample application is customer service tracking, said Thaddeus Bouchard, a Notes application specialist at Lotus and a developer of the Notes Application Library. This is a forms routing application used by a company's customer support organization to take incoming service requests, process them and route them to the appropriate organization to fulfill or respond to the request.

The Notes Application Library resides on a Notes database server at Lotus that users can dial in to. Users can replicate the entire library on their own servers or copy portions of it.

Ann Palermo, director of work group and messaging applications at International Data Corp., a Framingham, Mass., market research firm, applauded the library concept.

"The library will let users get right into doing work group applications rather than spending so much time building them," she said. ■

## Informix offers new front ends

*continued from page 23*

connection between an application development tool on a client PC and an Informix database server.

Support for new front ends will make it easier for users to develop graphical client/server applications that work against Informix databases. Previously, Informix only supported character-based applications at the desktop. With the new ver-

## Lotus to unveil SNADS gateway for cc:Mail

CAMBRIDGE, Mass. — Building on its commitment to integrate key software products into IBM environments, Lotus Development Corp. has announced that it will distribute a Systems Network Architecture Distribution Services (SNADS) gateway for its cc:Mail electronic mail system.

The SNADS/cc:Mail gateway was developed by LinkAge, Inc. of Ontario, Canada. The product supports a direct connection between cc:Mail and SNADS-compliant systems, such as IBM's OfficeVision/400 and Office Vision/MVS.

SNADS is IBM's distribution facility that supports E-mail and documents in SNA networks.

### Gateway support

The SNADS/cc:Mail gateway automatically converts cc:Mail messages and addresses into SNADS format and vice versa. The gateway provides support for multiple binary attachments, enabling users in cc:Mail or IBM environments to create a message, attach documents or other files and send the information.

In addition, delivery notification is supported across the gateway, informing the sender whether a message has been delivered.

The gateway, which is available now, is already being sold by Lotus on a reference basis. Pricing, which includes support service, begins at \$10,000 for three cc:Mail post offices.

— Timothy O'Brien

sion of Informix's character-based application development software, Informix-SQL, existing character-based applications will now run under Windows.

The new versions of the Informix software will support Versions 4.1 and 5.0. Informix-ESQL/C costs \$395, Informix-NET PC costs \$295 and Informix-SQL is priced at \$595.

Versions of the seven third-party products that will provide Informix server support will be available during the second half of this year. ■

## Store & Forward

*continued from page 23*

Sound with sound hardware from third-party vendors.

**Computer Associates International, Inc. (CA)** last week said it has signed an agreement to acquire Nantucket Corp., the developer of Clipper, a dBase/xBase-compatible database and application development tool set.

Terms of the deal were not disclosed. The acquisition, which will be accounted

for as a purchase transaction, will be subject to certain regulatory approvals and is expected to be completed within 30 days.

The proposed acquisition is intended to strengthen CA's position in the personal computer database market. Clipper operates in a DOS environment, while CA currently offers CA-dBase, a multiuser, stand-alone dBase/xBase-compatible development language and database for Microsoft Corp. Windows.

CA is expected to combine its dBase technology with that of Nantucket's next-generation object-oriented database. ■



# INDUSTRY UPDATE

VENDOR STRATEGIES, MARKET TRENDS, ALLIANCES AND FINANCIALS

## Worth Noting

**R**evenues from cellular services in North America will double from \$7.1 billion in 1991 to \$14.2 billion by year-end 1996, according to "Cellular Services in North America," a new report from Northern Business Information, a market research firm in Delran, N.J.

## People & Positions

**Luxcom, Inc.**, maker of the LC100 wiring hub, last week named **James Hood** to the newly created position of vice-president of research and development.

Hood will supervise the development of the Fremont, Calif., firm's hardware and software products. He will report to John Blokker, Luxcom's president.

Previously, Hood was president and chief operating officer of Vistron, Inc. in Sunnyvale, Calif.

**Staffan Fredricsson**, Luxcom's founder and chairman, previously oversaw R&D for the hub maker but will now focus on strategic relationships and the firm's long-term corporate strategy.

**Netrix Corp.**, a Herndon, Va., switch maker, has appointed **Alan Foreman** as managing director for its European, Middle East and African operations.

In the newly created position, Foreman will be responsible for Netrix sales activities in all of those regions.

Previously, Foreman was managing director of Timeplex, Ltd., where he was responsible for all Timeplex operations in France, Denmark and the U.K. **■**

## IBM's cellular technology poses problem for carriers

Channel hopping requires idle voice channels.

By Ellen Messmer  
Washington Correspondent

WASHINGTON, D.C. — The nine cellular carriers that have announced plans to back a technology IBM developed to transmit data over wireless voice channels acknowledged that there is a question of congestion in high-use areas that still needs to be addressed.

The carriers intend to use IBM's CelluPlan II technology ("Cellular nets to use IBM plan for data," *NW*, April 27) on data overlay networks that will enable them to support data on radio frequencies allocated for voice. But IBM's "channel-hopping" concept presumes that data will be sent over idle voice channels, and in congested cellular markets such as Los Angeles and New York, that option may not be available.

The carriers intend to address this thorny question at a technical briefing next week, but some point out that another approach to channel sharing by Cellular Data, Inc. (CDI) remains under

consideration and may be integrated into the IBM scheme.

IBM's technology has not yet been implemented or tested, although carriers said prototype equipment is now under development. CDI, on the other hand, has already built cell stations and wireless data terminals that have performed well in field trials conducted by Bell Atlantic Mobile Systems and GTE Mobile Communications.

The CDI method for sending data over standard voice channels squeezes data into the 3-kHz guard channel that separate each of the 416 30-kHz voice channels allocated to carriers in each market.

Last year in Houston, GTE Mobile Communications found that placement of CDI cell stations next to its existing voice-cellular cell stations was effective in transmitting data at 2400 baud to CDI's wireless data terminals.

"The test was successful," said Chuck Napier, manager of new business development at At-

(continued on page 26)

## INDUSTRY BRIEFS

**PacBell to market Teleos, Hayes gear.** Pacific Bell last week announced joint marketing agreements with both Teleos Communications, Inc. and Hayes Microcomputer Products, Inc. under which Pacific Bell will offer the two vendors' equipment in conjunction with its own Integrated Services Digital Network offerings.

Pacific Bell will market Teleos network access equipment, including ISDN terminal adapters, in conjunction with its Centrex Integrated Systems ISDN services. It will market Hayes ISDN terminal adapters and modems to complement its ISDN offerings and to provide users with one-stop shopping.

**Cheyenne buys stake, reports financials.** Cheyenne Software, Inc. last week announced it has acquired approximately a 5% interest in CompLink, Ltd., a privately held, New York-based manufacturer of messaging gateway software. Financial terms were not disclosed.

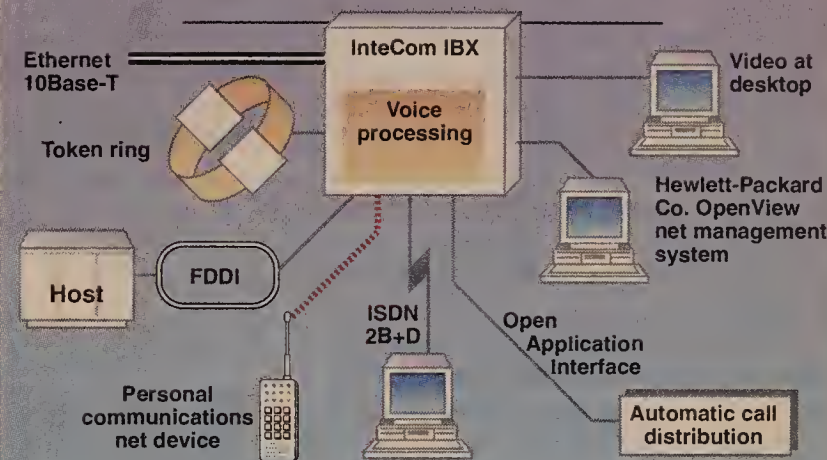
Cheyenne, based in Roslyn, N.Y., makes local-area network software, mostly for the Novell, Inc. NetWare market. Its products include Monitrix, network management software for NetWare nets, and ARCserve, an automated backup system.

Cheyenne plans to expand into the communications application market and will likely work with CompLink to develop new products, according to a spokesman.

Separately, Cheyenne reported \$68.5 million in third-quarter revenue for the period ended March 31. That figure is up 52.6%

(continued on page 26)

## InteCom reintroduces IBX as bandwidth controller



InteCom is repositioning its Integrated Business Exchange (IBX) as a centralized bandwidth manager that will serve as a hub for LAN, voice and video traffic, complete with advanced network management.

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: INTECOM, INC., ALLEN, TEXAS

## InteCom positions PBX as premises hub

Company announces plans to unveil 10Base-T, token-ring, FDDI cards, and net mgmt. support.

By Bob Brown  
Senior Editor

ALLEN, Texas — Determined not be dragged down by the overall slowness of the private branch exchange market, InteCom, Inc. has devised a new corporate strategy that positions its PBX as a platform for emerging local-area network and high-bandwidth technologies.

The company is planning to roll out 10Base-T, token-ring and Fiber Distributed Data Interface cards for its core Integrated Business Exchange (IBX) product line, as well as add network management support via Hewlett-Packard Co.'s OpenView net management systems.

InteCom said the addition of these components, which will be announced this summer, will enable customers to use its IBXs as backbone nodes supporting local wiring hubs and routers, and could even displace some of those devices. The strategy is largely targeted at InteCom's installed base.

InteCom plans to reveal the first of its new LAN products this summer with availability scheduled for the fall.

"We see our role not as a PBX provider, but as a systems provider for networking," said Hal Denton, vice-president of marketing at InteCom. "Over the next 18 months, we are going to be focusing more on data networking and integrated network capabilities."

InteCom's new strategy marks the company's return to its roots as an early proponent of integrated voice/data PBXs. The company strayed from its original mission when it was acquired by Wang Laboratories, Inc. in 1986, Denton said.

Under ownership of Matra S.A., a diversified French company that bought InteCom in 1990, InteCom has refocused and expanded its data networking efforts. The company's financial picture is improving, too, as it plans to break even this year.

InteCom plans to enhance the IBX, which already supports Ethernet interfaces, by offering interface modules for a series of other LANs, including token-ring and FDDI nets.

Each module will be powered by two newly developed Texas Instruments, Inc. C40 digital communications processors. The chips, which process 25 million instructions per second, are designed to let the IBX switch data at native 10M bit/sec Ethernet and 100M bit/sec FDDI speeds. Although InteCom supports Ethernet now, it only provides 1M bit/sec to the desktop.

"We believe there is a need for a backbone-level network approach that has the redundancy, distribution and flexibility of a system like ours," Denton said. "Rather than having many separate net devices, we will provide

(continued on page 27)



## Industry Briefs

*continued from page 25*

from \$44.9 million in revenue for the corresponding quarter last year. Cheyenne reported earnings of \$2.4 million for the quarter, about four times the \$546,000 earned in the third quarter last year. The company's numbers include revenue and earnings from Gates/FA, its 49%-owned microcomputer distributor subsidiary.

**IBM invests in software firm.** IBM last week said it will acquire an equity interest in Sapiens International Corp. The two firms also signed a software development agreement.

Financial terms of the investment were not disclosed.

Sapiens is a Cary, N.Y., company that develops and markets object-based software used to create applications for IBM mainframes and other platforms.

The software development agreement involves expanding the set of applications for IBM's AD/Cycle, a framework intended to speed and simplify application development. As part of this accord, Sapiens will extend its client/server product, Sapiens Workstation, to computers running OS/2.

**Ascend attracts new funds.** Inverse multiplexer manufacturer Ascend Communications, Inc. recently announced it has received \$7.57 million in venture funding, with the primary contributor listed as Chancellor Capital Management. Alameda, Calif.-based Ascend reported its total venture investment as \$18 million to date, which the company said it will use to expand its product line.

**CrossComm goes public.** CrossComm Corp. has filed a registration statement with the Securities and Exchange Commission for an initial public offering of 2.66 million shares of common stock. The Marlborough, Mass.-based router maker expects the public offering price to be between \$10 and \$12 per share. The company plans to use the funds raised by the offering for working capital and other general corporate purposes.

**ComputerLand nabs TRW group.** ComputerLand Corp. last week announced it has agreed to buy TRW, Inc.'s Customer Service Division, a \$110 million organization supporting some 13,000 customers. Terms of the deal were not disclosed.

The acquisition greatly expands the computer and network maintenance capabilities of ComputerLand, a Pleasanton, Calif., microcomputer dealer and network integration firm that garnered \$180 million in service revenue last year. TRW's service group is focused primarily on the hardware service and maintenance area, but about 5% of its business comes from local-area network support. The company also boasts 130 field representatives certified as Novell, Inc. technicians.

Officials at ComputerLand and TRW's Customer Service Division assured users that their regular service will not be disrupted.

ComputerLand plans to convert TRW operations over to its service information and reporting systems following the purchase, which is expected to be completed within 60 days.

**An American company in Paris.** AT&T Paradyne, Inc. announced the opening of its European Development Center in Sophia-Antipolis, France, to provide technical and marketing support for European customer requirements. The European Development Center will represent AT&T Paradyne before the European Telecommunications Standards Institute, as well as the Consultative Committee on International Telegraphy and Telephony and the International Standards Organization.

**IBM, Federated team up.** IBM and

Federated Department Stores, Inc. have signed a letter of intent under which the two companies will provide outsourcing services to retail firms.

Federated's information systems division, Sabre Group, and IBM's outsourcing subsidiary, Integrated Systems Solutions Corp., will provide retailers with services such as point-of-sale network services, electronic data interchange and other support.

The offerings will be based on services designed by Sabre Group and will be marketed by IBM. ■

## IBM's scheme poses problem for carriers

*continued from page 25*

lanta-based GTE Mobile Communications. "But you had to have tight control over the frequency, the power and the location of the antenna to avoid interference with voice."

Napier acknowledged that the carriers may find that the IBM technology, when subjected to rigorous field trials, may not be adequate simply because the carriers may not have spare voice channels for

## RAM Mobile Data and

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data. "In our saturated markets, you can't get a cellular voice channel. The value of a field trial is that it is possible to reach the conclusion that it would be counterproductive to market," he noted.

While Napier said the CDI technology is still under consideration, he emphasized that the IBM technique has strong appeal because it is an open specification that any manufacturer can adopt.

The IBM technology also permits higher data transmission speeds than CDI's method. However, the carriers backing IBM's CelluPlan II are sticking to the 19.2K

bit/sec rate widely used in radio equipment today in order to hold down user costs for implementing IBM's CelluPlan II spec, Napier explained.

The CDI method is designed for short, bursty data applications, while the IBM plan would allow interactive communications, according to Lee Horsman, CDI marketing manager.

Bell Atlantic Mobile Systems, which holds a 5% stake in CDI, recognizes that the cellular industry must back a common approach to hand off data from carrier to carrier for nationwide service coverage.

Tim White, director of business development at Bell Atlantic Mobile Systems, acknowledged that the CDI technology has not garnered sufficient carrier backing to deliver nationwide data support. He said the cellular industry's past failure to back a common voice standard created interoperability problems.

But both Napier and White said it seemed possible to integrate the IBM and CDI spectrum-sharing methods. Horsman agreed that the IBM CelluPlan II technology could probably be added as a software card to the CDI cell station. **Z**

## InteCom positions PBX as premises hub

*continued from page 25*

customers with an option for an integrated approach."

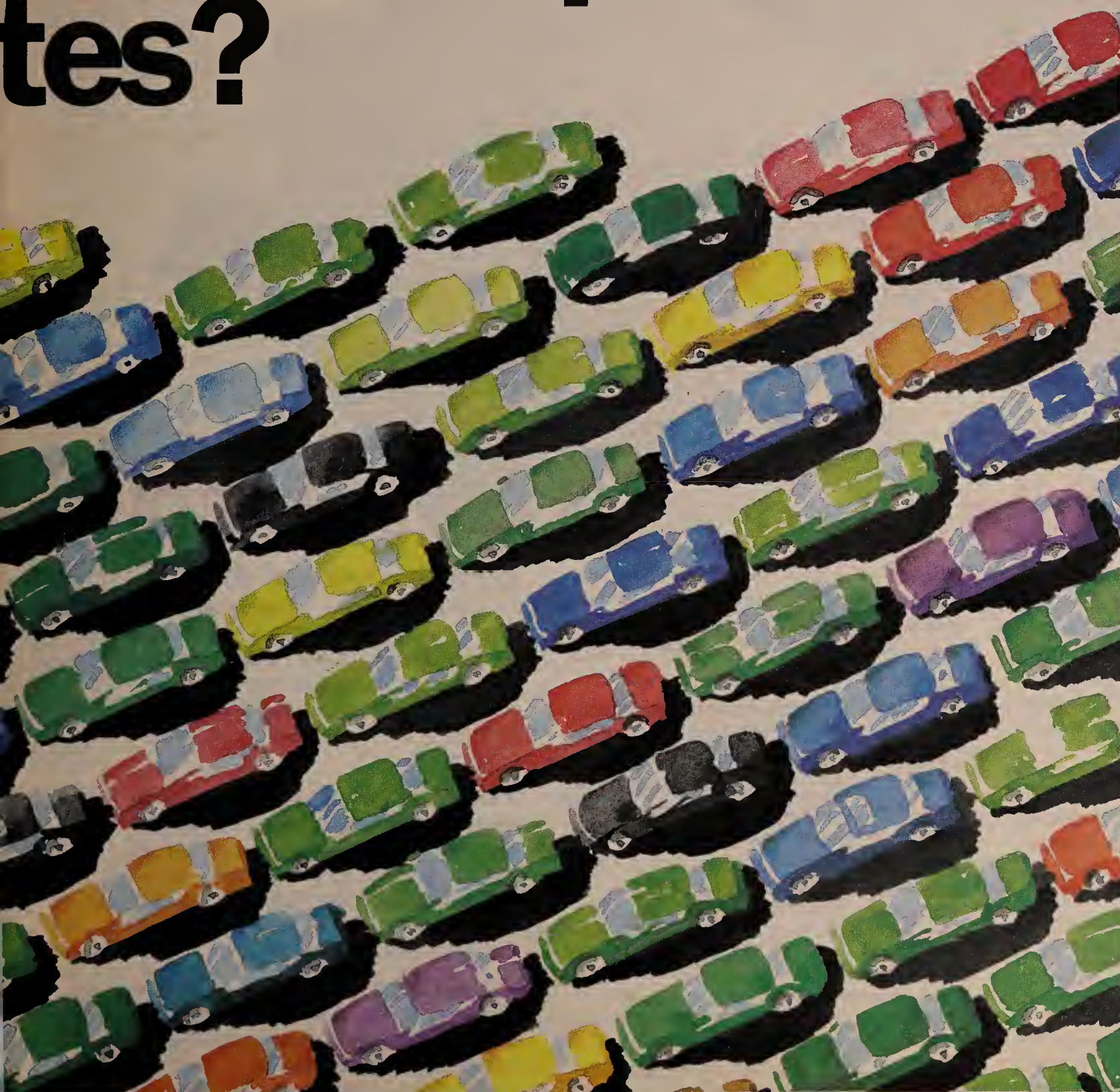
InteCom will rely on its Open Application Interface, an application program interface, to serve as a platform for building applications that allow users to marry their PBXs and computers. These applications might use automatic number identification and automatic call distribution systems to track down customer information in computer databases and feed that information to customer service representatives to help them provide better service.

InteCom is also working with Microsoft Corp., an InteCom customer, on a joint development project in which InteCom will build personal computer cards and Microsoft will design matching software to support integrated voice/data at the desktop.

InteCom's net management strategy focuses on HP's OpenView, which the switch maker will resell, Denton said. InteCom will develop a Simple Network Management Protocol application that can be run on OpenView and will let users control InteCom devices from an OpenView worksta-

## National Car Rental

# Customer's briefcase before his plane takes?



**‘W**hat InteCom is doing is slick and different. I just don't know if it's something people are screaming for.”

▲▲▲

tion. Initially, the OpenView-based application will manage the IBX for LAN and data traffic only, but InteCom will eventually provide a line card for the IBX that will convert management data for its voice features into SNMP so that they can be managed by OpenView.

Bob Alexander, an information technology lead specialist at Air Products and Chemicals, Inc. in Allentown, Pa., and president of the IBX Users Group Association, said it remains to be seen whether InteCom can deliver on its promise.

"There's some appeal to having a single supplier," he said. "But you want to be careful about putting all of your eggs in one basket."

Nancy Aldrich, practice manager at Computer Task Group, Inc., a Lowell, Mass., consulting firm, applauded InteCom's move. "What InteCom is doing is slick and different," she said. "I just don't know if it's something people are screaming for."

Given that pricing is not yet available, Aldrich said it is difficult to judge whether users will be able to cost-justify InteCom's approach. Adding all of the functionality InteCom promises could prove expensive.

InteCom's greatest challenge may be political — figuring out how to get telecommunications and MIS managers to buy its products. "The question of who owns the network is still up in the air," she said. "InteCom may have to find the perfect users with perfect applications to buy into this, and that could be difficult." **Z**



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# MANAGEMENT STRATEGIES

ENTERPRISE NETWORK STRATEGIES, USER GROUPS AND MANAGING PEOPLE AND TECHNOLOGY

## Worth Noting

“We have made a commitment to avoid purchasing proprietary software. [It] brings short-term profit but long-term pain.”

**William Connor**  
Director of information technology  
General Systems Sector  
Motorola, Inc.  
Tempe, Ariz.

## Manager Minutes

Picking an appropriate venue, the **International Disaster Recovery Association (IDRA)** has announced it will hold a one-day telecommunications seminar on flooding disaster recovery on May 28 at the Holiday Inn at O'Hare International Airport in Chicago.

Coming on the heels of the flood in downtown area of that city, which closed many businesses, the seminar will address several concerns, including planning considerations.

The registration fee is \$395 and includes handouts and attendance at all sessions. For more information, call (508) 842-0050.

The U.S. Chapter of the **Digital Equipment Computer Users Society** has announced the election of three members to its Board of Directors.

The elected directors are board incumbent Emily Kitchen, manager of information services at Dalkon Shield Claimants Trust in Richmond, Va.; David Johnson, manager of data privacy and integrity for Lockheed Missiles & Space Company, Inc. in Sunnyvale, Calif.; and Jeffrey Jalbert, president of JCC, a software consulting firm in Granville, Ohio. □

## Association offers materials to help users battle viruses

Books, tutorial offer information on how viruses are introduced, along with virus protection, removal.

By Salvatore Salamone  
Features Writer

MECHANICSBURG, Pa. — Learning about viruses and educating end users about the havoc they can wreak is the subject of three offerings from the National Computer Security Association (NCSA).

Two books and an interactive tutorial that runs on an IBM personal computer can help managers keep viruses from infecting their nets and teach them how to remove viruses once an infection occurs.

*The Executive Guide to Computer Viruses*, written by NCSA staffer Charles Rutstein and designed for net managers, starts with an overview of the virus problem, defining viruses and how they infect computers.

There is also a short chapter dedicated specifically to network viruses.

The book offers advice on how to detect and remove viruses and discusses many of the most common strains.

Two chapters are dedicated to practical suggestions on how to fight viruses and prevent infections, while another outlines policies for preventing and removing viruses.

Additionally, there is a very

meaty appendix listing cures for many common strains.

*The Executive Guide to Computer Viruses* is priced at \$50, or \$25 for NCSA members.

NCSA also offers *The Computer Virus Survival Guide* for end users. Like the *Executive Guide*, it suggests methods for preventing, removing and fighting viruses.

The *Survival Guide* defines computer viruses and explains how they are introduced. It contains several chapters on various approaches for preventing viruses as well as sections dedicated to virus detect.

The guide is priced at \$9.95, or \$5 for NCSA members.

### Interactive tutorial

Another aid for educating end users about viruses is the NCSA Virus Tutorial, an interactive program that runs on PCs and guides users through virus background information and prevention. The shareware package was developed by NCSA and carries a licensing fee of \$1 per copy.

The tutorial can be downloaded from NCSA's bulletin board by calling (202) 364-1304. The books can be ordered by writing to NCSA at 227 W. Main Street, Mechanicsburg, Pa. 17055. □

## HP, DEC air multivendor net services

By Wayne Eckerson  
Senior Editor

Hewlett-Packard Co. and Digital Equipment Corp. recently began offering implementation and support services to customers building multivendor computer and network environments.

DEC's Value-added Implementation Services (VIS) enable customers to outsource the implementation and integration of DEC and non-DEC systems.

According to DEC officials, the company can install new systems in an average of four days, following a two-week staging period

at DEC premises, during which time DEC assumes full liability for software and hardware. VIS, which includes help desk support services and training, is priced at 6% to 10% of the total project cost.

HP recently announced HP Site Design and Implementation and HP Integrated Support for Network and System Operation.

HP Site Design and Implementation assists customers in designing, modifying or relocating computer nets. With the HP Integrated Support service, the firm will manage customers' net operations and help desk functions, as well as stage and distribute new integrated computer systems.

For information about HP's services, call (800) 452-4844. For details about DEC's VIS service, call Don Montgomery, VIS marketing manager, at (508) 467-2969. □

## MANAGING TECHNOLOGY

BY DAVID FERRIS

## Client/server database models slowly emerging

Database applications on PC nets give a tremendous return on investment — usually much more than word processing, spreadsheet or other applications. But this critical technology is undergoing a fundamental change: It is migrating to a client/server architecture.

Today's personal computer network-based database applications put all the intelligence in the PC. The file server simply stores data files; it's just a glorified local hard disk (see graphic, this page). So, for example, when you update a record, indexes are processed on the PC, or when you request a sort, the entire data file is downloaded to the PC. The file server has no ability to manage or control the data.

This file server architecture for database applications has two big problems.

First, you can't usually have more than five or 10 concurrent operators. Performance rapidly degrades because files and indexes must constantly be moved over the wire.

Second, in order for more than one application to access the data, the system usually has to duplicate the data in different file formats. The problem is that these extracted data files get out of synch and users are never sure which file has the most up-to-date information, if any.

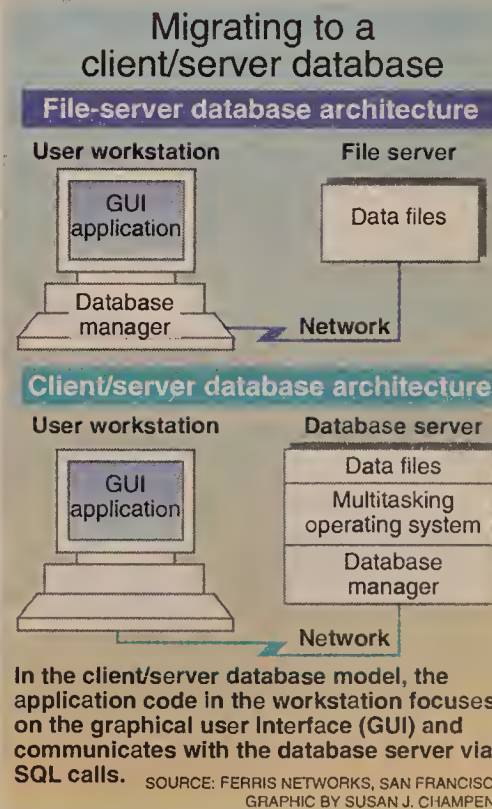
A client/server database architecture fixes these problems. In the client/server model, the file server has intelligence and can manage a database. It typically runs a full-blown relational database manage-

ment system and is variously known as a database server, database engine or back end.

The main database server software packages are IBM's Database Manager, Oracle Corp.'s Oracle Server and Sybase, Inc.'s SQL Server. Others include Novell, Inc.'s NetWare SQL and Gupta Technologies, Inc.'s SQLBase. The technology is still very young, and it's unclear which vendors will dominate.

Usually, a database server runs in its own PC, typically an 80386 machine or higher. This plugs into the PC network with a standard network adapter card. It's also possible to run some database server software in an existing file server. For example, Oracle Server for NetWare runs in a NetWare/386 file server and Oracle for VINES runs in a Banyan Systems, Inc. file server.

Because it is likely to be hit with a variety of concurrent requests, database server software runs under a multitasking operating system such as OS/2 (continued on page 30)





## Client/server models slowly emerging

continued from page 29  
or Unix.

It's common, by the way, to have the database server run OS/2 while running a non-OS/2 operating system such as NetWare or VINES. Database servers use an operating system-independent method to communicate with workstations, such as Named Pipes, the Network Basic I/O System or LU 6.2.

In the client/server world, life for

workstation software is much easier. The software is responsible for displaying what the user sees, editing and validating data, and interpreting keyboard, mouse and other user input. However, it no longer has to manage data.

When workstation software needs to access or manipulate information, it sends a request to the database server. A typical request might be "Update the address of this record" or "List all customers in New York who have bought more than \$100,000 in products this year." Workstations of this type are known as clients or front ends.

The database server then executes these commands and replies accordingly. Typically, the answers are short, such as "OK, I've made the update" or "There are 20 customers you want to know about and they are . . ." Bulk file transfers are rare.

SQL is used for these workstation-to-database server conversations. It's a simple English-like language designed for database access that relies on commands such as SELECT and FROM to perform database queries.

For example, "SELECT customer—name, credit—balance FROM customer—

—table WHERE credit—balance > 1000" is a request for a list of customers whose credit balances exceed \$1,000.

There are three big advantages to the client/server database architecture over the file server approach.

First, as the initial bugs in client/server database access methods are ironed out, companies will be able to build information storage and retrieval systems with hundreds of concurrent users. This will let them construct large transaction processing systems using low-cost workstations rather than expensive mainframes.

Second, the client/server database model allows users to buy office automation software from any vendor. For example, a warehouse could have a series of Borland International, Inc. Paradox applications, which handle sales and order entry functions, while the inventory management and accounting functions are written in DataEase International, Inc.'s DataEase. A word processing package from Microsoft Corp. may access customer information for promotional mailings, while the sales manager uses a Lotus Development Corp. spreadsheet to analyze recent orders and project sales, and a graphics package to produce pie charts.

Here, users and programmers choose the package that's right for the task at hand. All programs access the same integrated database and work from the most up-to-date data because there are no redundant extract files lying around.

Users maintain the integrity of the shared database using rules-based logic built into the database engine. For example, database administrators define rules that ensure the field values are reasonable, such as that a person's age is less than 120 years.

Administrators can also write stored procedures, which are pieces of code that users can call to execute routine database queries. Triggers are also pieces of code that monitor the values of specified fields and perform a predefined action when the value of the field exceeds predefined parameters. Users can program triggers to execute a stored procedure, for example.

Software vendors — whether producers of workstation software or database server software — are finding it difficult to migrate from the file server to the client/server database model. Initial releases are taking much longer than anticipated. Nevertheless, the various bits and pieces are gradually falling into place.

Customers, too, are encountering difficulties. Programmers must learn new concepts and skills because client/server versions of application development tools have been slow to appear and frequently programmers have to grovel around in C. It's not surprising that today, file-server architectures are still the rule.

Nevertheless, it's clear that the migration is under way. Within five years, client/server database applications should be commonplace. PC networks will provide a single, protected shared data resource. This will be accessed by a wide variety of application software packages and by large numbers of concurrent users.

*Ferris is president of San Francisco-based Ferris Networks, which offers research reports, conferences, seminars and continuous research programs.*

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Data networking is the fastest growing area of communications. And it's especially challenging with multiple DP vendors and compatibility issues. BBN is a specialist in data networks. We've built all kinds of mission-critical networks, from classic packet switching to SNA to inter-networking.

#### 2. Take care of your installed base.

Don't let a vendor dazzle you with next year's standards. While standards are important,

your business depends on the MIS systems you've already installed. That's why BBN supports a wide range of standard and vendor interfaces, such as async, bisync, X.25, SNA, TCP/IP, DECnet™, Novell IPX™, AppleTalk®, and emerging OSI standards.

#### 3. Look at the services behind the network.

A network is more than a set of boxes. It's a solution that works for your business. BBN's network experts are among the most knowledgeable in the industry. By understanding your requirements first, we can design and deliver an end-to-end solution customized to your organization.

#### 4. Don't underestimate the value of experience.

In networking, what you don't know could hurt you. That makes BBN's experience especially important. We built the first packet-switching network 20 years ago. Since then we've

built networks for many of the world's leading government and commercial organizations.

There's a lot more to consider in networking. That's why BBN has put together the "Networking Knowledge Series," a collection of interviews and articles from some of the leading experts in the communications industry. The series will give you valuable insights into the trends and issues that are shaping networking in the 1990s. To receive your free set, please call today.

And remember, BBN's experience could make the difference between a network that goes up on time, and one that goes up in smoke.

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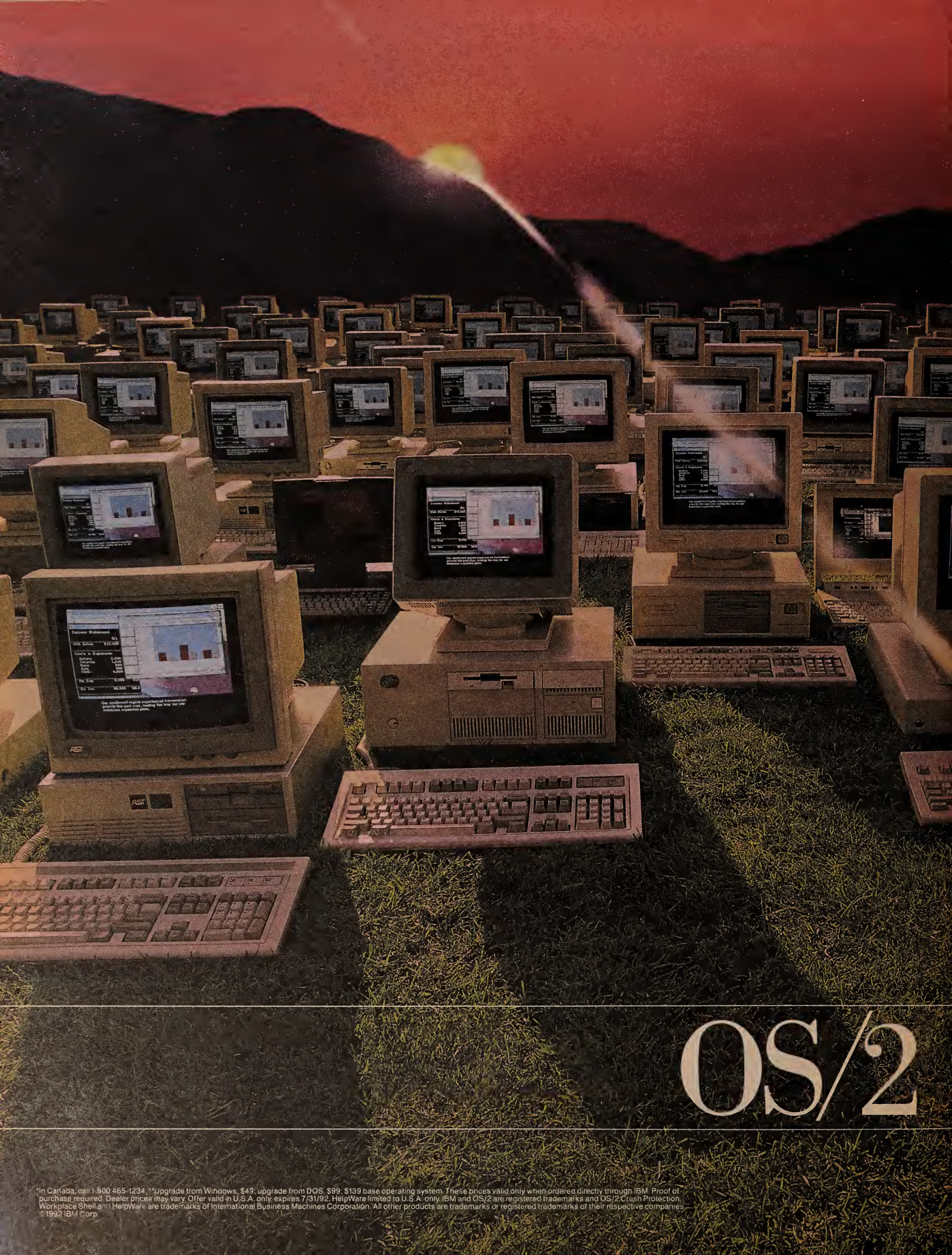
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## INTERNETWORKING

BY DOUGLAS WELCH

# LAN managers revert to typical mainframe habits

Once heralded as the great equalizer in computer technology, local-area networks are increasingly being managed and operated like the mainframes they typically replace. Desire for greater control and adoption of outdated mainframe management methodologies have led many LAN managers to retreat to glasshouses, distancing themselves from their users.

The driving force behind the personal computer and LAN revolution was the freedom to access and manipulate data without offering "sacrifices" to the mainframe "priests" that controlled it. PCs and LANs brought an end to this tyranny by allowing data to flow freely and easily to those needing it most.

Unfortunately, revolution can often end in reactionary politics, and the LAN staff is not immune. Now that LAN managers have gained a position of power, they are adopting the same control methods as the mainframe priests they replaced. Although the data processing methods have changed, the attitudes of those in charge of the processing have not. The once-rebellious LAN managers have turned into the establishment; they have formed their own priesthood. In the name of greater security and management, LAN managers are erecting barriers to the free flow of information among users.

LAN managers are in the business of providing solutions to users, but all too often, they implement solutions that are best for themselves. The results are similar throughout the industry — cryptic naming of network services, lengthy procedures for assigning and changing accounts, and general operational procedures that ensure LAN managers retain total control. When they make decisions, these managers often consider users' needs to be less important than their own.

LAN managers and their staffs increasingly lack any true interaction with users. To them, users are little more than logon names and printer definitions. It is time for them to get out and discover which solutions users really need, rather than spending all their time locked away monitoring the network. While nearly 100% network uptime is an admirable goal, it falls far short of the services LAN managers should be providing.

Now that networks are stable and reliable, it is time for these managers to reach out to users. They should not fortify themselves against users but seek to apply their knowledge to all aspects of their company's business.

LAN managers and their staffs should become involved with projects from the onset so they can influence decisions that would typically be made without any thought to data communications needs. If the company is designing a new office, the LAN staff should be on hand to provide specifications for data wiring and outlets. If a project is being planned that requires files to be sent from coast to coast, the LAN staff can begin testing and building the necessary communications structure to accommodate the plan. If software testing is occurring, the LAN manager should provide disk space and management for the pilot project. With advanced knowledge of projects, LAN technicians will be more informed and better able to anticipate users' current and future needs.

By seeking this integration and expansion, LAN managers and their staffs can ensure that they will be around for years to come and they won't become victims of their own bad habits. By exercising compassion and caution, they can avoid another user revolution. **W**

*Welch is a support analyst for a major entertainment corporation in Los Angeles.*

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Phone: (703) 266-1537  
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Fax: (415) 771-2817

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## EDITORIAL

# Software vendors must make product quality Job One

The software industry has a big problem — quality.

While other industries have made great strides toward total quality management and zero-defect products, software vendors are struggling to produce interoperable bug-free products. And software buyers are getting stuck testing products and making them play in an enterprise network.

Users say that after building an integrated network platform — a LAN internet, for instance — they're faced with the bigger job of implementing the dozens of new software releases and upgrades vendors generate year after year. New graphical user interfaces, operating systems, router and bridge software, new applications, ad infinitum.

Just loading all these products and getting organized with new documentation is difficult enough, but users also have to deal with the unexpected problems that can disable networks and ravage productivity.

Software packages that once worked together no longer interact so amiably, processes that once flowed smoothly grind to a halt, and users are left to figure out what went wrong and why.

A net executive for a major company claimed that new software releases threaten a gradual destruction of the firm's integrated net. Instead of focusing on new uses of the network, the net staff spends a large part of its time just dealing with software changes and maintaining interoperability among systems.

One net manager has banned deployment of new releases for at least a year until other companies have discovered any problems in the products and the vendor has worked them out. His company also rigorously tests new software in its own lab, and he figures that the benefits lost from delaying implementation are more than offset by the reduced disruption to the net.

Customers have lived with this problem long enough. Software vendors must step up the job of testing products to ensure that they work as promised and interoperate as claimed.

Users should not be unwilling beta sites. When they purchase or upgrade software for their enterprise networks, it should work. Period. **W**



# OPINIONS

## GLOBAL SERVICES

BY MARVIN CHARTOFF

### Promise of global frame relay service hampered

Global public frame relay service, available from a few small value-added network providers, has emerged in the past year as an alternative to expensive high-speed private-line or low-performance X.25 public data network (PDN) services.

Unfortunately, the promise of high-speed global frame relay service has yet to be realized because major carriers are slow in entering the market, which is handicapped by the lack of a frame relay network interconnect standard.

The past year has seen several carriers announce plans for deployment of public frame relay services for both domestic and global coverage.

AT&T, BT North America, Inc., Cable & Wireless North America, Inc., CompuServe, Inc., Graphnet, Inc., Infonet Services Corp., Sprint Corp. and WilTel have domestic frame relay services, while only a few plan to offer a global service. This limited global expansion is surprising considering most of these carriers have established a global presence through their global X.25 services.

International coverage for frame relay services will be available later this year only from BT North America, Cable & Wireless North America and Infonet in a limited number of locations.

AT&T and Sprint are considering alternatives for either deploying their own frame relay nodes in select foreign countries or interfacing with in-country frame relay services provided by the local post, telegraph and telephone administrations.

Why has global expansion of frame relay been so slow? Two contributing factors are the unfinished standards work on a network-to-network interface (NNI) and the limited number of frame relay points of presence

(POP) carriers are willing to deploy around the world.

The Frame Relay Forum, an industry group developing frame relay interoperability standards, is close to completing an NNI standard that will enable carriers to pass traffic between their frame relay networks. The standard will allow different frame relay networks to resolve permanent virtual circuit address conflicts, exchange billing and link status information, coordinate alarm and fault resolution, and control congestion.

These functions are similar to the ones supported by the X.75 standard currently used to interconnect X.25 PDNs. The X.75 standard has enabled carriers offering global X.25 services to economically extend the reach of those services to many locations within a country by interfacing to the local PTT-provided X.25 PDN.

However, it will take time for frame relay equipment vendors to implement the standard and then for carriers to add it to their switches. Pacific Bell and Covia Partnership, unwilling to wait until the NNI standard is complete, recently tested a proprietary approach to linking a public frame relay service with a private frame relay network.

Without an NNI standard, carriers offering global frame relay services will initially deploy one or two POPs in a country and require customers to lease long-distance circuits to back-haul frame relay traffic from their facility to the closest carrier POP. In addition to being expensive, the back-haul approach, which could require running frame relay over copper instead of fiber, will likely increase the amount of errored frames.

Carriers willing to rush frame relay service to market before adoption of an NNI standard can install more POPs in a country to

avoid back-hauling traffic. Currently, the monopolistic control PTTs have on in-country telecommunications services makes this a difficult task.

However, many European countries are starting to loosen the control they have on the PTTs and open the door for more competitive in-country services. Yet carriers have been cautious about deploying even one POP in many countries where many U.S. multinationals have extensive operations.

Since these countries are also slower in installing new technology locally, using the NNI would not be a viable option because there would be no local frame relay service.

The general carrier response to the time frame for broadening global frame relay service is that it will be expanded only where market demand dictates.

Carriers are reluctant to respond to requests for service in uncovered locations because they don't want to commit to delivering service to a location until they are sure a critical mass will develop. The problem with this response is that if they wait until a critical mass develops, most customers will simply explore and select other options.

High-speed global networks are necessary for multinational companies to remain competitive. The Frame Relay Forum, equipment vendors and carriers must finalize and accept the NNI standard as quickly as possible. Doing so will be a big step forward in achieving far-reaching global frame relay connectivity.

In addition, carriers should adopt a "build it and they will come" attitude toward deployment of frame relay POPs. **Z**

*Chartoff is a senior manager with the Network Strategies Practice of Ernst & Young in Vienna, Va.*

## TELETOONS

BY FRANK AND TROISE



## LETTERS

### Today's multimedia nets

In your recent article "Multimedia finally appears within networks' reach," (NW, April 6), author Peter Davidson does a good job of explaining what multimedia is and how a variety of network technologies can be used to support the emerging applications that utilize the multimedia concept.

However, the article shows a definite bias when discussing the various vendors' multimedia offerings.

The article describes in great detail Fluent, Inc.'s FluentLinks and Lotus Development Corp.'s 1-2-3 for Windows with SmartHelp and CD-Networker. However, according to Davidson's article, neither of these products is available to the general public.

Davidson's article also discusses products such as IBM's Person to Person, Bell Communications Research's MetaMail and Sun Microsystems, Inc.'s VideoPix, none of which, according to the article, incorporate full-motion video.

However, the article barely mentions Digital Equipment Corp.'s DECspin, which is available today, runs full-motion video as well as voice and data over Fiber Distributed Data Interface or Ethernet in addition to allowing inclusion of voice, data and video within compound documents.

This article does a disservice to the reader as well as to DEC by not devoting an equal amount of space to a product that meets the application performance criteria users are seeking in multimedia applications today.

Debbie Joy  
Senior network consultant  
Digital Equipment Corp.  
Acton, Mass.

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# Enterprise Networking



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## BRIDGES

# Bulking up bridges

CONTINUED FROM PAGE 1  
built-in fault tolerance or redundancy.

While this added functionality makes the buying decision more intricate, but some of the new bridge features can help net managers gain flexibility, protect their existing investments and make their networks easier to use and maintain.

The Buyer's Guide chart lists 48 vendors of local and remote dedicated bridges and a total of 103 bridge models.

### Routing capability

A growing bridged net eventually needs routing capabilities to maintain network throughput, reliability and management control. Vendors and systems integrators say their major area of user education is when to bridge and when to route (see "To bridge or to route?" page 38).

But the contrast between bridges, routers and hubs is fading as vendors combine the functions of each device. Adding routing capabilities to bridges or bridging capabilities to router platforms turns them into bridge/routers. A bridge operates at the data link layer — Level 2 of the Open Systems Interconnection model — while a router operates at the network layer, or Level 3.

For the purpose of this Buyer's Guide, any bridge that routes at the network layer is considered a bridge/router and will be cov-

### CHART • GUIDE

A Buyer's Guide chart comparing the features of dedicated bridges begins on page 40.

*New models offer flexible features, functions to meet changing network needs.*

ered in a Buyer's Guide on routers later this year.

Most of the current routing support in bridge/routers is for Transmission Control Protocol/Internet Protocol, but support for other protocols will be added over the next year or two. Vendors plan routing support for about one-third of the local bridges and one-quarter of the remote bridges in this week's Buyer's Guide.

Of the vendors listed here, 19 plan to offer routing support for their dedicated bridges, including such companies as IBM, Retix and Xyplex, Inc.

Integration of bridge, router and hub functions is achieved by adding software modules with bridging or routing capabilities to hardware platforms or by adding card-level bridges and routers into intelligent wiring concentrators. From a network management perspective, it is easier to manage a single, integrated unit than multiple devices.

### Address table size

Addressing is basic to bridging; without an address, a bridge does not know where to send a data packet. A transparent bridge

*(continued on page 38)*



(continued from page 37)  
such as an Ethernet bridge, requires an address table to direct packets to end-station nodes, while a source routing bridge — such as a token-ring bridge — handles addressing in the end stations.

to have a table with an entry for each active network station. Bridge performance can degrade if there are more active stations than the address forwarding table can handle or if the table is so large that lookups take too long. Source routing bridges have

and Vitalink Communications Corp. push the address table limits beyond 8,000 entries, while Digital Equipment Corp. and Fibronics International, Inc. offer FDDI bridges with address table sizes of 16,000 and 22,000 entries, respectively.

CrossComm, unlike other vendors, embeds its address processor and directory in specialized hardware, which allows for very fast processing — 10 microseconds — to look up an address, regardless of the number of names in the table. The software approach preferred by most vendors can process one name quickly, but lookups become slower as names are added to the table.

“Forwarding tables are very important with OSI and the new [DEC] DECnet Phase V, which opens up thousands of nodes,” says Ken Woloschuk, network analyst for SaskTel, the local telephone company for the Canadian province of Saskatchewan.

His WAN uses 65 bridges from DEC, Vitalink and Technically Elite Concepts. He selected the latter’s Network Professor/Interchange for its 56,000-entries address table, achieved by expanding memory from 4M to 16M bytes.

#### Filtering characteristics

Comparing bridge filtering and forwarding rates from prod-

uct data sheets is oversimplifying the task; the rates depend on packet length and the mix of small and large packets being forwarded or filtered.

A network operating at the data link layer is limited by the smallest maximum frame size of any of its subnetworks, effectively eliminating the advantages of

internetwork by allowing only traffic destined for other LANs to pass onto the internetwork.

However, filtering has a price. As a bridge examines each incoming packet for filtering data, its table gets larger and it takes longer to process the packet. As the network becomes more complex and the number of elements to fil-

## “Forwarding tables are very important with OSI and the new DECnet Phase V.”



Recognizing that users are growing their bridged connections throughout the enterprise, vendors are increasing the address table size in their bridges.

A bridge address table contains dynamic entries, in which the bridge uses an aging technique to periodically delete source address entries with no recent activity, and static entries, created by a net administrator. These administrative entries are filters, created to restrict certain packets between specific net sub-segments or end-station nodes.

Bridges use the destination station’s address to determine whether to forward a frame, requiring every bridge in a network

unlimited addressing because they use no table. Transparent bridges vary in address table size, which until recently has been about 2,000 to 4,000 entries. But newer products extend that limit.

Local bridges in the Buyer’s Guide range in address table sizes from a low of 512 for Hewlett-Packard Co.’s HP 28673A to a high of 56,000 for Technically Elite Concepts, Inc.’s Network Professor/Interchange four-port model. Most remote bridges can now handle up to 8,000 or more entries, led by CrossComm Corp.’s 40,000 entries for members of its HSB family.

Bridges from Andrew Corp., CrossComm, Retix, 3Com Corp.

## To bridge or to route?

Bridges and routers are used together in most networks. However, deciding where to bridge and where to route directly affects the network’s responsiveness and its cost. Net traffic, some of which is not routable, and frame sizes are the determining factors.

Progressing from a simple bridge to an advanced bridge with more complex filtering is a straightforward decision for better network management. An advanced bridge increases the complexity of the network but does not change the basic net model; the bridge is still operating at the relatively simple data link layer of the Open Systems Interconnection model.

But choosing among an advanced bridge, a bridge/router or a pure router is a challenge. Routing implies more functionality and flexibility than bridging, as well as significantly greater complexity.

This overlap is driven heavily by the number of available ports. While a multiport bridge can cost more than a router, an advanced bridge tends to cost about 20% less than a router for the same number of ports.

A true cost comparison, however, must include the ongoing costs of network operation and management because routing introduces complexity and staff support requirements may increase. A manageable cost trade-off between routing and bridging is to route between bridge domains.

Routers typically implement bridging in a default, or fallback, mode when they encounter protocols, such as Digital Equipment Corp.’s Local Area Transport, that are unroutable and must be bridged.

Additionally, a router is more tolerant of network failure than a bridge is because it operates with multiple paths between source and destination nodes. Also, a router can support redundant network paths, using both on a least cost or fastest route basis.

A bridge supporting the Spanning Tree Algorithm would only use a redundant path if the primary path fails, thus incurring costs for idle links. But the spanning tree bridge’s ability to dynamically generate a new logical topology makes it more tolerant of network failure than a

learning bridge, where a single failed link can severely impact bridge performance.

Throughput performance, or packet rates, is the major trade-off between bridges and routers. Their central processors are essentially equivalent, but because routers operate at the network layer, the processor must discover more information about the frames by performing a set of condition checks in order to process them.

#### Making the decision

Given a bridge and router with identical architectures and the same performance profile, supporting a single media access method, such as Ethernet, the bridge will be faster. Because it uses less software, it will also be less expensive.

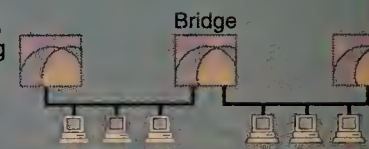
If an internetwork has multiple media access methods, such as Ethernet and token ring, some routers may be required to perform translation between the two. Translations from either Ethernet or token ring to Fiber Distributed Data Interface, however, are faster with an FDDI bridge than with a router.

— Patricia Cope

### Bridging alternatives

#### Simple bridging

LANs are connected individually by bridges, and traffic must proceed through intervening bridges to reach its destination. Too many intermediate bridges may result in an unacceptable delay. Cascaded dual-port bridges may isolate some network traffic.



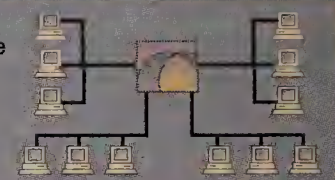
#### Backbone bridging

Multiple LANs can be bridged to a backbone in order to avoid local traffic congestion. The backbone itself may eventually become a bottleneck.



#### Multiport bridging

Several LANs share a bridge and communicate among one another over the device’s internal bus or pass data onto a wide-area circuit. Shared intelligence, especially for network management, can significantly reduce the bridge’s per-port cost.



GRAPHIC BY SUSAN SLATER

SOURCE: M/R CONSULTING COMPANY, INC., SEATTLE

larger frame sizes in some technologies. Given equivalent packet sizes and mixes, laboratory tests show minimal differences between similar products.

Vendors are adding more filtering capabilities to their bridges, giving users more flexibility in directing traffic across their internets. Filtering determines if a frame — data, along with a destination and source address — is local or remote. Forwarding is the transmission of a frame to another network.

A bridge examines the source

ter increases, performance slows.

At some point, which varies among networks, complex filtering can slow bridge performance significantly enough that a router may become a more attractive choice.

Many types of filtering are implemented in bridges, varying from one product to another. The trend is toward more filtering capabilities, particularly user-defined filters, to maximize flexibility. Destination or source filtering can prevent sensitive data

## Vendors are adding more filtering capabilities to their bridges.



address of an incoming packet, constructs a source address table to associate it with the local-area network on which it was received and compares the destination address to the source address table. If the destination address is not found in the table or if it is associated with another LAN, the packet is forwarded. If there’s a match, the packet is filtered and kept on the LAN.

In general, the more ways you can configure the bridge to filter, the greater the control of access to specific LAN resources and better utilization of wide-area lines and CPU power, increasing network performance and giving added access security. Filtering can increase throughput on the

from getting onto or leaving a LAN, and filters in remote bridges can restrict usage of expensive WAN links.

A common problem in a complex internetwork is mapping the physical architecture to the multiple logical architectures, or domains. Logical filtering lets a network administrator program a bridge to filter or forward packets based on certain information contained in the packet, allowing multiple LAN segments to be treated as a single LAN.

For instance, a filter on the protocol identifier — such as Local Area Transport or Novell, Inc. Internetwork Packet Exchange (IPX) — can restrict systems

(continued on page 45)



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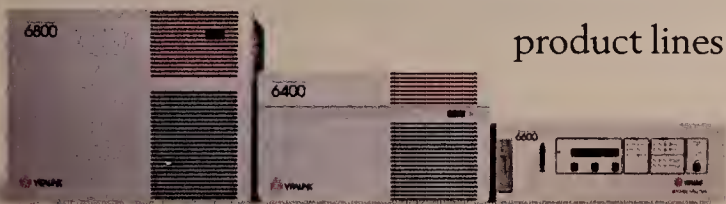
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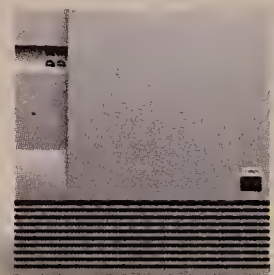
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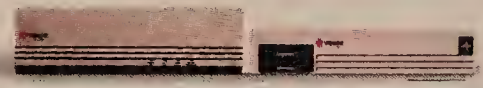
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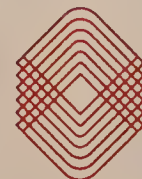
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# Dedicated bridges (continued on page 42)

Vendor	Product	Bridge type	Total ports	Configuration	LAN support and connector type	WAN support	Forwarding rate	Filtering rate	Filtering criteria	Link-level protocol	Management support	Price/Warranty
Accton Technology Corp. Fremont, Calif. (800) 926-9288	EtherBridge-Local	Local	2	Stand-alone	Ethernet: AUI, BNC, DB-15	NA	10,000 packet/sec	12,000 packet/sec	Transparent	SRT	SNMP	\$1,549/2 years
Alantec San Jose, Calif. (800) 727-1050	PowerHub	Local	18	Stand-alone	Ethernet: AUI, BNC, RJ-45; FDDI: dual-attached station/single-attached station, MIC	NA	62,000 packet/sec	62,000 packet/sec	User-defined	STP	SNMP	\$16,800/1 year
Anco Corp. Brea, Calif. (800) 545-2626	E6000 E-Net High-Speed Bridge	Local	2	PC-based	Ethernet: DB-15, BNC, RJ-45	NA	9,100 packet/sec	14,880 packet/sec	MAC address	None	None	\$595/5 years
Allied Telesis, Inc. Mountain View, Calif. (800) 424-4284	AT-6870	Local	2	Stand-alone	Ethernet: AUI, BNC	NA	12,500 packet/sec	25,000 packet/sec	User-defined	STP	None	\$2,450/Hardware: 1 year; free software upgrades
	AT-6875	Local	2	Stand-alone	Ethernet: AUI, BNC	NA	12,500 packet/sec	25,000 packet/sec	User-defined	STP	SNMP	\$2,995/Hardware: 1 year; free software upgrades
Andrew Corp. Torrance, Calif. (800) 733-0331	Bridgeport 7606	Local	2	Stand-alone	Token ring: DB-9	NA	2,100 frame/sec	160,000 frame/sec	MAC, NETBIOS address	SR, SRT	IBM's NetView and LAN Network Manager, proprietary	\$4,995/1 year
	Bridgeport 7606 SRT	Local	2	Stand-alone	Token ring: DB-9	NA	2,100 frame/sec	160,000 frame/sec	MAC, NETBIOS address	SRT	LAN Network Manager, proprietary	\$6,595/1 year
	Bridgeport 7412-16	Remote	2	Stand-alone	Token ring: DB-9	RS-232, RS-422, V.35, T-1, fractional T-1	1,900 frame/sec	80,000 frame/sec	MAC, NETBIOS address	SR	LAN Network Manager	\$5,595/1 year
Artel Communications Corp. Hudson, Mass. (800) 225-0228	Galactica	Local	36	Stand-alone (rack-mountable optional)	Ethernet: 15-pin AUI, BNC, RJ-45; 10Base-FL: ST	NA	200,000 packet/sec	476,000 packet/sec	Multicast, broadcast, restricted address	STP	SNMP	From \$19,950 to \$54,300/Hardware: 1 year; software: 90 days
Cabletron Systems, Inc. Rochester, N.H. (603) 332-9400	NB 20E	Local	1	Stand-alone	Ethernet: AUI	NA	8,000 packet/sec	15,000 packet/sec	User-defined, source, destination	STP	SNMP	\$2,995/90 days
	NB 25E	Local	1	Stand-alone	Ethernet: AUI	NA	11,000 packet/sec	28,000 packet/sec	User-defined, source, destination	STP	SNMP	\$5,495/90 days
	NB 30	Remote	3	Stand-alone	Ethernet: AUI, BNC, DB-15, RJ-45, ST, SMA fiber connectors	RS-422, RS-449, V.35, T-1, fractional T-1, E-1	2,900 packet/sec	10,000 packet/sec	Source, destination, protocol type, broadcast	STP, HDLC	SNMP, proprietary	\$8,500/90 days
Caliber Tek, Inc. Foster City, Calif. (800) 638-9757	Token-Sphere 4000 Remote	Remote	2	Stand-alone	Token ring: DB-9	RS-232, RS-422, RS-449, X.21, V.35, T-1, fractional T-1, E-1, RS-530	3,900 frame/sec	4M bit/sec; 20,000 frame/sec; 16M bit/sec; 77,000 frame/sec	Address, link limiting, NETBIOS limiting	SR, HDLC, LAP B	SNMP, NetView, LAN Network Manager, proprietary	\$5,890/1 year
	Token-Sphere 2000	Local	2	Stand-alone	Token ring: DB-9	NA	3,900 frame/sec	153,600 frame/sec	Address, all fields, link limiting, NETBIOS limiting	SR	SNMP, NetView, LAN Network Manager, proprietary	\$4,690/1 year
Canoga-Perkins Chatsworth, Calif. (818) 718-6300	EtherSphere 100	Local	2	Stand-alone	Ethernet: DB-15, BNC	NA	14,000 packet/sec	25,000 packet/sec	Address, protocol type	Transparent	SNMP, proprietary	\$2,495/1 year
	8850 Local 802.3 Bridge	Local	2	Stand-alone	Ethernet: AUI, BNC, RJ-45, ST, SMA and FC fiber connectors; FOIRL: ST	NA	10,000 packet/sec	12,000 packet/sec	Source	Transparent	None	From \$2,095 to \$3,695/1 year
	8850M	Local	2	Stand-alone	Ethernet: AUI, BNC, RJ-45, ST, SMA and FC fiber connectors; FOIRL: ST	NA	8,000 packet/sec	10,000 packet/sec	Source	STP	SNMP	From \$3,095 to \$4,695/1 year
	8860 Remote 802.3 Bridge	Remote	2	Stand-alone	Ethernet: AUI, BNC, RJ-45, ST, SMA and FC fiber connectors; FOIRL: ST	RS-232, RS-449, V.35, T-1, E-1	100 packet/sec	12,000 packet/sec	Source	STP, HDLC	None	From \$2,530 to \$5,028/1 year
	8860M	Remote	2	Stand-alone	Ethernet: AUI, BNC, RJ-45, ST, SMA and FC fiber connectors; FOIRL: ST	RS-232, RS-449, V.35, T-1, E-1	80 packet/sec	8,000 packet/sec	Source	STP, HDLC	SNMP	From \$2,630 to \$6,028/1 year
Chipcom Corp. Southborough, Mass. (800) 228-9930	Ether-modem Bridge 8300B	Local	2	Stand-alone	Ethernet: AUI; broadband Ethernet	NA	13,400 packet/sec	24,200 packet/sec	Destination	STP	DEC's Remote Bridge Management Software	\$8,950/1 year
	Midnight Bridge 8383B	Local	2	Stand-alone	Ethernet: AUI, ST, SMA fiber connectors	NA	10,000 packet/sec	20,000 packet/sec	Destination, protocol type	STP	SNMP	From \$2,950 to \$3,950/1 year
CrossComm Corp. Marlborough, Mass. (800) 388-1209	HSB-EE	Local	2	Stand-alone	Ethernet: DB-15, BNC	NA	15,000 packet/sec	30,000 packet/sec	All fields	STP	SNMP	\$3,000/90 days
	HSB-ETT	Remote	3	Stand-alone	Ethernet: AUI, BNC	RS-232, RS-422, RS-449, X.21, V.35	15,000 packet/sec	30,000 packet/sec	All fields	STP	SNMP	\$7,995/90 days
	HSB-ELL	Remote	3	Stand-alone	Ethernet: AUI, BNC	RS-232, RS-422, RS-449, X.21, V.35	15,000 packet/sec	30,000 packet/sec	All fields	STP	SNMP	\$5,995/90 days



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# XYPLEX



## Dedicated bridges (continued on page 44)

Vendor	Product	Bridge type	Total ports	Configuration	LAN support and connector type	WAN support	Forwarding rate	Filtering rate	Filtering criteria	Link-level protocol	Management support	Price/Warranty
Develcon Electronics, Ltd. Saskatoon, Saskatchewan (800) 667-9333	100	Remote	3	Stand-alone	Ethernet: DB-15, BNC, RJ-45	RS-232, RS-422, V.35, T-1, fractional T-1, E-1, V.11	3,000 packet/sec	17,500 packet/sec	All fields, user-defined	STP, HDLC	SNMP	\$2,745/Lifetime
	120	Local	2	Stand-alone	Ethernet: DB-15, BNC, RJ-45	NA	11,000 packet/sec	17,500 packet/sec	All fields, user-defined	STP, HDLC	SNMP	\$2,495/Lifetime
	200	Remote	3	Stand-alone	Token ring: DB-9	RS-232, RS-422, V.35, T-1, fractional T-1, E-1, V.11	3,000 frame/sec	80,000 frame/sec	User-defined	SR, HDLC	Proprietary	\$3,650/Lifetime
	220	Local	2	Stand-alone	Token ring: DB-9	NA	3,500 frame/sec	80,000 frame/sec	User-defined	SR	Proprietary	\$3,695/Lifetime
	I-Gate Model 150	Remote	2	Stand-alone	Ethernet: DB-15, BNC	ISDN BRI	250 packet/sec	17,000 packet/sec	User-defined	STP	SNMP, proprietary	\$4,695/Lifetime
Digital Equipment Corp. Maynard, Mass. (800) 344- 4825	LAN Bridge 150	Local	3	Stand-alone	Ethernet: 15-pin AUI, ST fiber connector	NA	13,404 packet/sec	24,272 packet/sec	Destination	STP	Digital Equipment Corp's DECMcc Director	From \$6,500 to \$7,500/1 year
	LAN Bridge 200	Local	3	Stand-alone	Ethernet: 15-pin AUI, BNC, ST fiber connector	NA	14,880 packet/sec	29,760 packet/sec	User-defined	STP	DECMcc Director	From \$8,500 to \$14,000/1 year
	DECbridge 500 Series	Local	2	Stand-alone	Ethernet: 15-pin AUI, BNC; FDDI: MIC or Ferrule Coupled Physical Connector	NA	14,480 packet/sec	460,000 packet/sec	User-defined	STP	SNMP, DECMcc Director	From \$21,000 to \$41,000/1 year
	DECbridge 600 Series	Local	4	Stand-alone	Ethernet: AUI; Fiber: ST	NA	20,000 packet/sec	480,000 packet/sec	User-defined	STP	SNMP, DECMcc Director	From \$30,000 to \$45,000/1 year
	DECbridge 90	Local	2	Stand-alone	Ethernet: BNC	NA	14,847 packet/sec	29,694 packet/sec	Protocol type	STP	SNMP	\$2,890/1 year
D-Link Systems, Inc. Irvine, Calif. (714) 455-1688	DI-1100 Local Bridge	Local	2	Stand-alone	Ethernet: AUI, BNC, RJ-45D	NA	12,000 packet/sec	20,000 packet/sec	User-defined	STP	SNMP, proprietary	\$2,395/1 year
	DI-1120 Remote Bridge	Remote	2	Stand-alone	Ethernet: AUI, BNC, RJ-45D	RS-232	10,000 packet/sec	74,800 packet/sec	User-defined	STP	SNMP	\$2,395/1 year
	DI-1140 High Speed Remote Bridge	Remote	3	Stand-alone	Ethernet: AUI, BNC, RJ-45D	RS-232, RS-422, RS-449, V.35, T-1	10,000 packet/sec	74,800 packet/sec	User-defined	STP	SNMP	\$4,250/1 year
Dowty Communications, Inc. Menlo Park, Calif. (415) 508-2500	DCP 4802	Local/Remote	4	Stand-alone, rack-mountable	Ethernet: AUI, DB-15	V.35, T-1, fractional T-1, frame relay	11,000 packet/sec	14,880 packet/sec	User-defined	Frame relay	Proprietary	\$5,995/1 year
Fairchild Data Corp. Scottsdale, Ariz. (800) 247-9489	LBR 8323	Local	2	Stand-alone	Ethernet: AUI; 10Broad-36: F-Type	NA	14,000 packet/sec	25,000 packet/sec	User-defined	STP	SNMP, Hewlett-Packard Co.'s OpenView	\$6,995/1 year
FiberCom, Inc. Roanoke, Va. (800) 423-1183	RingMaster 7200	Local/Remote	30	Stand-alone (rack-mountable optional)	Ethernet: AUI; FDDI: MIC	RS-422, V.35	21,500 packet/sec	500,000 packet/sec	User-defined	STP	SNMP	\$3,500 per port/1 year
Fibronics International, Inc. Hyannis, Mass. (800) 327-9526	FX 8210	Local	6	Stand-alone	Ethernet: AUI; FDDI: MIC	NA	20,000 packet/sec	416,000 packet/sec	Source, destination, type field	SR, STP	SNMP, NetView, LAN Network Manager	From \$20,000 to \$30,000/90 days
	FX 8610 Workstation Server	Local	14	Stand-alone	Ethernet: RJ-45, AUI; FDDI: MIC	NA	15,000 packet/sec	416,000 packet/sec	Source, destination	STP	SNMP, proprietary	\$32,000/90 days
Gandalf Premier Wheeling, Ill. (708) 541-6060	LANLine 5220	Local/Remote	4	Stand-alone	Ethernet: AUI, BNC	RS-232, V.35, V.11	2,000 packet/sec	15,600 packet/sec	Protocol	STP	SNMP, proprietary	\$2,645/1 year
Hewlett-Packard Co. Palo Alto, Calif. (800) 752-0900	HP 28673A	Local	2	Stand-alone	Ethernet: AUI, via 10Base-T transceiver; FOIRL: via transceiver	NA	29,760 packet/sec	29,760 packet/sec	User-defined	STP	SNMP	\$3,900/1 year
	HP 28674A	Local/Remote	2	Stand-alone	Ethernet: AUI, via 10Base-T transceiver; FOIRL: via transceiver	RS-232, RS-422, RS-449, X.21, V.35, T-1, fractional T-1, E-1	29,760 packet/sec	29,760 packet/sec	User-defined	STP, HDLC	SNMP, OpenView	\$3,999/1 year
	HP 28681A	Local	2	Stand-alone	Ethernet: AUI, via 10Base-T transceiver; FOIRL: via transceiver	NA	29,760 packet/sec	29,760 packet/sec	User-defined	None	None	\$1,950/1 year
Hughes LAN Systems, Inc. Mountain View, Calif. (800) 395-5267	ProBridge 8033	Local	2	Stand-alone	Ethernet: AUI, BNC	NA	13,000 packet/sec	25,000 packet/sec	User-defined	STP	SNMP	\$2,995/1 year
	ProBridge 8133	Remote	2	Stand-alone	Ethernet: AUI, BNC	RS-232, RS-449, V.35, frame relay	3,000 packet/sec	25,000 packet/sec	User-defined	STP, HDLC	SNMP	\$3,995/1 year
IBM Armonk, N.Y. (800) 426-2468	Token Ring Network Bridge Program	Local/Remote	4 or 5	Stand-alone	Token ring: standard 9-pin token-ring connector	T-1	3,950 frame/sec	62,000 frame/sec	User-defined, custom filters	SR	NetView, LAN Network Manager	\$1,750/1 year
	IBM 8209	Local	2 or 3	Rack-mountable	Ethernet: 15-pin D-shell connector; token ring: standard 9-pin token-ring connector	NA	3,000 packet/sec	10,000 packet/sec	User-defined, custom filters	SRT	NetView, LAN Network Manager	\$8,000/1 year
Intellcom, Inc. Chatsworth, Calif. (818) 407-3900	Quick Net 6000 Model 604/B	Local	2	Stand-alone	Ethernet: AUI, BNC, RJ-45, via transceiver	NA	14,720 packet/sec	27,000 packet/sec	User-defined	STP	SNMP	\$1,475/2 years



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# Dedicated bridges (continued on page 51)

Vendor	Product	Bridge type	Total ports	Configuration	LAN support and connector type	WAN support	Forwarding rate	Filtering rate	Filtering criteria	Link-level protocol	Management support	Price/Warranty
Intercomputer Communications Corp. Cincinnati (800) 274-6633	RLN	Remote	16	Software	Ethernet: NA	RS-232	NA	NA	Address	PPP	Proprietary	From \$430 to \$6,620/1 year
Kalpana, Inc. San Jose, Calif. (800) 488-0775	EtherSwitch EPS-700	Local	7	Stand-alone, rack-mountable	Ethernet: AUI	NA	44,640 packet/sec	104,160 packet/sec	Destination	None	SNMP	\$10,995/1 year
	EtherSwitch EPS-1500	Local	15	Stand-alone, rack-mountable	Ethernet: AUI	NA	104,160 packet/sec	223,200 packet/sec	Destination	None	SNMP	From \$5,995 to \$19,995/1 year
Lancast Amherst, N.H. (800) 752-2768	ENT-4330	Local	2	Stand-alone	Ethernet: AUI	NA	12,000 packet/sec	20,000 packet/sec	None	SR	None	\$1,995/1 year
Lanwan Technologies, Inc. Santa Clara, Calif. (408) 374-8190	LW 1010	Local	2	Stand-alone	Ethernet: AUI, BNC, RJ-45	NA	14,800 packet/sec	21,600 packet/sec	User-defined	STP	SNMP	\$1,650/2 years
	LW 1020	Local/Remote	2	Stand-alone	Ethernet: AUI, BNC, RJ-45	RS-232, RS-449, V.35	2,660 packet/sec	20,600 packet/sec	User-defined	STP	SNMP	\$2,250/2 years
Madge Networks, Inc. San Jose, Calif. (800) 876-2343	Smart 16/4 AT Bridge	Local	2	2 adapters, PC required	Token ring: DB-9	NA	8,500 frame/sec	160,000 frame/sec	User-defined	SR	LAN Network Manager, proprietary	\$3,995/5 years
	Smart 16/4 MC Bridge	Local	2	2 adapters, PC required	Token ring: DB-9	NA	9,500 frame/sec	160,000 frame/sec	User-defined	SR	LAN Network Manager, proprietary	\$3,995/5 years
Magnalink Communications Corp. Norwood, Mass. (617) 255-9400	Series 4000 CB-4	Remote	6	Stand-alone	Ethernet: BNC, DB-15; Token ring: DB-9	RS-232, RS-422, RS-449, X.21, V.35, T-1, fractional T-1, T-3, E-1	7,000 packet/sec	14,800 packet/sec	User-defined	STP, LAP B	SNMP	From \$6,900 to \$17,000/1 year
	Series 3000 HCB	Remote	3	Stand-alone	Ethernet: BNC, DB-15; Token ring: DB-9	RS-232, RS-422, RS-449, X.21, V.35, T-1, fractional T-1	7,000 packet/sec	14,480 packet/sec	User-defined	STP, HDLC, LAP B	SNMP	From \$4,950 to \$12,000/1 year
Micom Communications Corp. Simi Valley, Calif. (800) 642-6687	Marathon Net Runner	Remote	2	Stand-alone	Ethernet: AUI	RS-232	220 packet/sec	10,000 packet/sec	All fields	STP, HDLC	SNMP, proprietary	\$3,500/Hardware: 3 years; software: 1 year
Motorola Codex Mansfield, Mass. (800) 544-0062 Netronix, Inc. Petaluma, Calif. (800) 282-2535	EtherSpan	Remote	25	Stand-alone	Ethernet: DB-15	V.35, T-1, fractional T-1	NA	NA	Address	STP	Proprietary	From \$6,300 to \$12,600/1 year
	EtherMaster 100	Local	2	Stand-alone	Ethernet: AUI, BNC	NA	14,000 packet/sec	25,000 packet/sec	All fields	Transparent	SNMP, proprietary	From \$2,590 to \$2,990/1 year
	Token Master 2000	Local	2	Stand-alone	Token ring: IBM Type L-3	NA	4,000 frame/sec	153,600 frame/sec	All fields	SR	SNMP, NetView, LAN Network Manager, proprietary	\$4,690/1 year
	Token Master 4000	Remote	2	Stand-alone, rack-mountable	Token ring: IBM Type L-3	RS-232, RS-422, RS-449, X.21, V.35, T-1, fractional T-1, E-1	4,000 frame/sec	77,000 frame/sec	All fields	STP, HDLC	SNMP, NetView, LAN Network Manager, proprietary	\$5,890/1 year
Network Express, Inc. Ann Arbor, Mich. (800) 553-4333	NE 3000	Local/Remote	33 or 34	Stand-alone	Ethernet: AUI, BNC; Token ring: DB-9	V.35, T-1, fractional T-1, ISDN Primary Rate Interface and BRI	14,880 packet/sec	14,880 packet/sec	User-defined, protocol type	SR, STP	SNMP, proprietary	From \$5,500 to \$36,000/1 year
Olicom USA, Inc. Plano, Texas (214) 423-7560	Local Bridge 16/4 (MCA)	Local	1	PC-based	Token ring: DB-9, RJ-45	NA	14,000 frame/sec	65,000 frame/sec	User-defined	SR	NetView, LAN Network Manager	\$2,680/3 years
	Local Bridge 16/4 (ISA)	Local	1	PC-based	Token ring: DB-9, RJ-45	NA	14,000 frame/sec	65,000 frame/sec	User-defined	SR	NetView, LAN Network Manager	\$2,680/3 years
	Remote Bridge 16/4 (MCA)	Remote	2	PC-based	Token ring: DB-9, RJ-45	X.21, V.25, V.35, T-1, fractional T-1, E-1	4,614 frame/sec	12,500 frame/sec	User-defined	SR, STP	NetView, LAN Network Manager, proprietary	\$3,100/3 years
	Remote Bridge 16/4 (ISA)	Remote	2	PC-based	Token ring: DB-9, RJ-45	X.21, V.25, V.35, T-1, fractional T-1, E-1	4,614 frame/sec	12,500 frame/sec	User-defined	SR, STP	NetView, LAN Network Manager, proprietary	\$3,100/3 years
Penril Datacomm Networks, Inc. Gaithersburg, Md. (800) 473-6745	Series 2500	Local	126	Stand-alone	Ethernet: AUI; FDDI: dual-MIC	NA	60,000 packet/sec	506,000 packet/sec	All fields, user-defined, source, destination	STP	SNMP	\$44,000/1 year
Performance Technology, Inc. San Antonio, Texas (800) 327-8526	POWER-bridge-DOS	Local/Remote	20 or 36	Stand-alone	Ethernet: RJ-11, BNC; Token ring: DB-19; FDDI: DB-15; Arcnet: BNC	RS-232, RS-422, X.25, V.35	WAN: 320 packet/sec; LAN: 600 packet/sec	WAN: 320 packet/sec; LAN: 600 packet/sec	NETBIOS	HDLC, X.25	Any NETBIOS network management	\$995/90 days, software only
	POWER-bridge-OS/2	Local/Remote	20 or 36	Stand-alone	Ethernet: RJ-11, BNC; Token ring: DB-19; FDDI: DB-15; Arcnet: BNC	RS-232, RS-422, X.25, V.35	WAN: 320 packet/sec; LAN: 600 packet/sec	WAN: 320 packet/sec; LAN: 600 packet/sec	NETBIOS	HDLC, X.25	Any NETBIOS network management	\$1,495/90 days, software only
Persoft, Inc. Madison, Wis. (800) 368-5283	Intersect Remote Bridge-Ethernet	Remote	2	Stand-alone	Ethernet: BNC, DB-15, RJ-45; wireless (antenna)	Spread-spectrum RF	12,700 packet/sec	22,000 packet/sec	User-defined, address, protocol type	STP	None	\$6,495/30 days
	Intersect Concentrator	Local	2	Stand-alone	Ethernet: BNC, DB-15, RJ-45; wireless (antenna)	Spread-spectrum RF	12,700 packet/sec	22,000 packet/sec	User-defined	STP	None	\$4,995/30 days
	Intersect Local Bridge	Local	2	Stand-alone	Ethernet: BNC, DB-15, RJ-45	NA	10,600 packet/sec	22,000 packet/sec	Source, destination	STP	None	\$1,495/30 days



(continued from page 38)

that adhere to a particular protocol stack, allowing networks to be segmented into domains of related subnets, such as DECnet or Novell NetWare LANs, with similar performance characteristics.

This is particularly useful in combating TCP/IP broadcast storms by filtering out TCP/IP broadcasts originating from certain host computers. Some bridges can filter on arbitrary byte patterns in the packet itself, supporting domains that serve particular departments.

#### Source routing transparent

Relatively new to the bridge scene, the new source routing transparent (SRT) standard combines two techniques —

The bridge determines if a packet requires source routing or transparent bridging and filters or forwards accordingly. An address table is required for an SRT bridge.

▲▲▲

source routing and the IEEE 802.1d transparent bridge standard — on a single bridge to provide connections between source routing IBM networks and non-IBM transparent networks, such as NetWare-based LANs.

The SRT bridge determines if a packet requires source routing or transparent bridging and filters or forwards accordingly. An address table is required for an SRT bridge.

A number of vendors have announced SRT support. The Raycom Systems, Inc. FDDIring 200 dual-port local bridge operates at 16M bit/sec, filtering 153,600 packet/sec on each port. It filters on source and destination addresses and supports SNMP and LAN Network Manager (for IBM NetView environments). Routing support is planned.

Filtering rates are very high for FDDI bridges, which operate at 100M bit/sec. DEC's DECbridge 500 and 600 series of Ethernet-to-FDDI local bridges have an aggregate filtering rate of 460,000 and 480,000 packet/sec, respectively.

FiberCom, Inc.'s RingMaster 7200 local and remote bridge filters at 500,000 packet/sec, and Fibronics' FX 8210 Ethernet-to-FDDI and token ring-to-FDDI bridges filter at an aggregate maximum of 416,000 packet/sec on the FDDI side.

For token-ring networks, the Madge Networks, Inc. Smart 16/4 AT Bridge and Smart 16/4 MC Bridge local dual-port bridges filter at 160,000 frames per second. Caliber Tek, Inc. Token-Sphere 2000 and 4000 bridges are unusual in that they can be configured by the user for 4M or 16M bit/sec token rings.

The dual-port Model 2000 local bridge

filters a 16M bit/sec token ring at 153,600 frames per second for both ports, and the Model 4000 dual-port remote bridge filters a 16M bit/sec token ring at 77,000 frames per second on the local side.

Most of the dual-port Ethernet bridges in the Buyer's Guide filter at aggregate rates greater than the theoretical per-port Ethernet maximum of 14,880 packet/sec.

Aggregate rates range from 10,000 to 30,000 packet/sec, with many in the 20,000-plus packet/sec range. These include Caliber Tek's dual-port local bridge, the EtherSphere 100, filtering at 25,000

packet/sec for both ports, and CrossComm's HSB-EE dual-port local bridge at 30,000 packet/sec.

#### Load sharing

Redundant bridge paths between two Ethernets create loops, which could overload the network with misordered or misdirected packets that needlessly propagate themselves across the net. There may be instances, however, in which redundant paths are created for backup purposes.

The IEEE 803 Spanning Tree Algorithm is used to avoid loops by creating tempo-

rary redundant paths between networks. The algorithm allows for backup bridges or load balancing (load sharing) over multiple, parallel bridges, using alternate paths or deactivated links to distribute the traffic load.

Each vendor has its own load balancing algorithm, so buyers should be aware that the load balancing features of bridges from different vendors may not work together.

The advantage of load balancing is that equipment and expensive WAN communication lines do not sit idle. Distributed load

(continued on page 46)

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(continued from page 45)

balancing can make for near-routing capability, in which all wide-area lines connected to a bridge are used simultaneously to send data, as opposed to traditional bridge methods in which some lines remain idle.

The use of parallel links could create greater aggregate bandwidth. But the algorithm takes longer as the network expands, a problem compounded in large networks by frequent changes in topology. Load sharing can be avoided by having bridges that can forward at full network bandwidth capacity, thereby alleviating

network or link loads.

At some point, the network manager must turn to other solutions, such as multiport bridges, FDDI bridges, address-filtering bridges or routers.

#### Net management support

Management support, whether the open systems approach of SNMP or proprietary systems, takes on greater importance as internetworks grow more complex.

Although bridge management products in some cases are more expensive than the

bridge itself, a single point of management becomes attractive as network operation and maintenance costs swell. Of the products in the Buyer's Guide, 62 come with some level of SNMP support, including several models from CrossComm, DEC, Netronix, Inc., Retix and Vitalink.

Users will find different SNMP implementations, but most of those implementations will provide the same functionality.

Dan O'Halloran, data network specialist for the San Juan Unified School District in Carmichael, Calif., has just completed a three-year project, installing a low-cost

bridged network connecting 72 locations managed from a central site. The HP OpenView management systems he installed proved so meritable, he had no trouble convincing his superiors to upgrade from OpenView for Windows to HP's more expensive Unix version.

"[OpenView for Windows] had all the information I needed," O'Halloran says. "It gives the status of bridges and hubs at remote sites, and I can set about 60 different alert thresholds for each bridge, such as the number of packets or power outages."

#### WAN interfaces

WAN interfaces on remote bridges dictate the type of lines and speeds a bridge can support. While vendors have traditionally provided T-1 and lower speed interfaces on their units, they are increasingly offering interfaces to newer services such as fractional T-1, Integrated Services Digital Network and frame relay offerings.

Management support, whether the open systems approach of SNMP or proprietary systems, takes on greater importance as internetworks grow more complex.



Magnalink Communications Corp. provides a T-3 connection. There is a small but growing demand for T-3, although it is not yet widely available. Dowty Communications, Inc., Hughes LAN Systems, Inc. and Xyplex provide frame relay interfaces, and a host of vendors including Dowty, Olicom USA, Inc., HP, Retix and 3Com offer fractional T-1 interfaces.

Wireless technology is an alternative approach to remote bridging over relatively short distances. Persoft, Inc.'s Intersect Remote Bridge-Ethernet connects two Ethernet LAN segments as far as three miles apart by broadcasting data over spread-spectrum radio frequencies. It is a board-level bridge for personal computers, requiring a minimum Intel Corp. 80286 platform and sells for \$6,495. A token-ring version will ship in June. Persoft's Intersect Concentrator product connects wired and wireless Ethernet LANs, providing media access control-layer bridging. It sells for \$4,995.

#### FDDI support

FDDI bridges represent the high end of the market, where they primarily connect several lower speed LANs to an FDDI backbone.

Most FDDI nets are used between floors and buildings in a campus setting. Vendors must support FDDI due to customer demand, but it is not turning out to be the

(continued on page 52)



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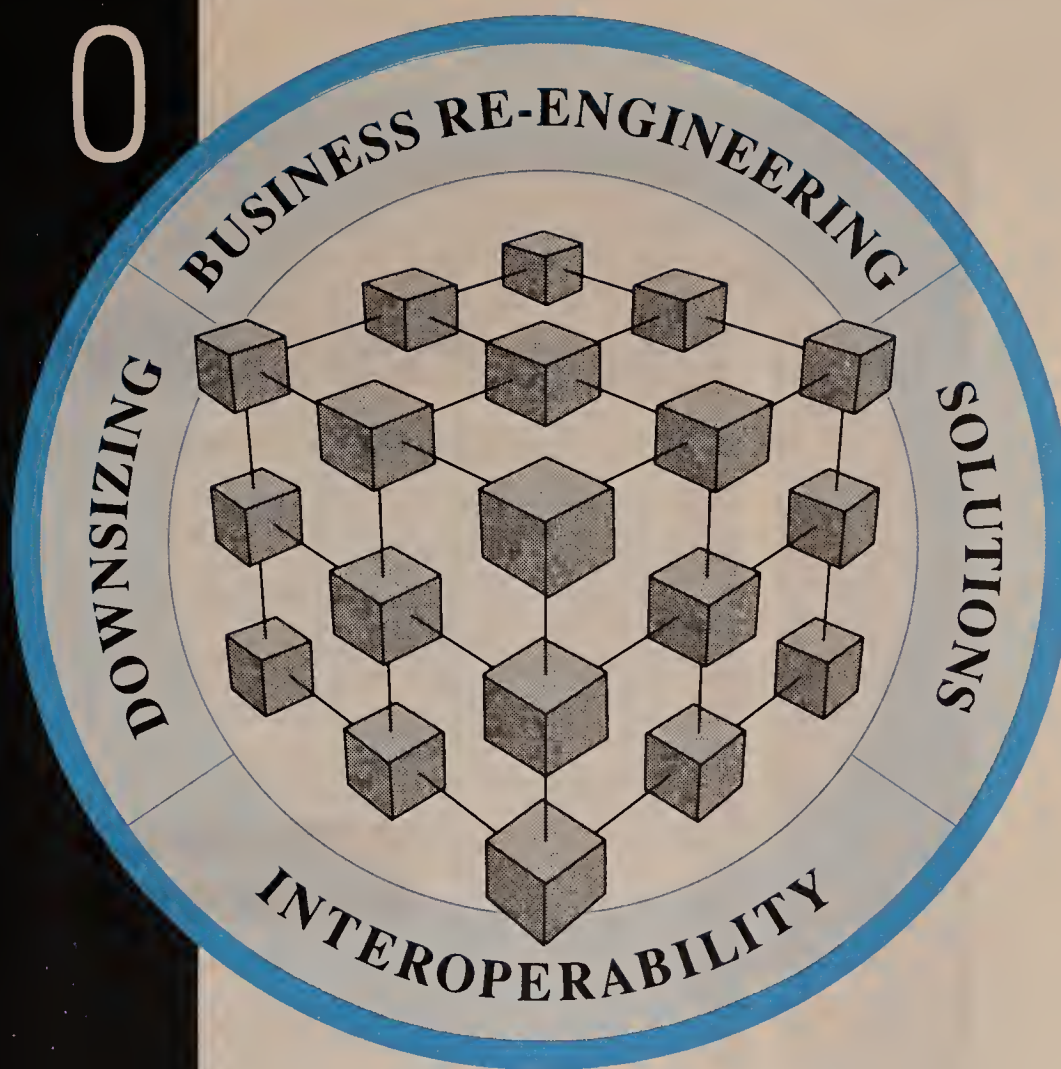
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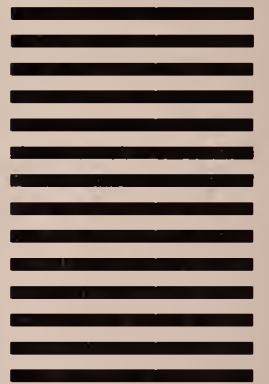


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# Dedicated bridges (continued on page 52)

Vendor	Product	Bridge type	Total ports	Configuration	LAN support and connector type	WAN support	Forwarding rate	Filtering rate	Filtering criteria	Link-level protocol	Management support	Price/Warranty
<b>Racal-Datcom, Inc.</b> Boxborough, Mass. (800) 526-8255	RNX 6300 Multiport Bridge	Local/Remote	30	Stand-alone	Ethernet: AUI	V.35	30,000 packet/sec	75,000 packet/sec	All fields, user-defined, LAN segment number	STP	SNMP	\$17,690/Hardware: 1 year; software: 90 days
<b>RAD Data Communications</b> Mahwah, N.J. (800) 444-7234	TRE-1	Remote	3	Stand-alone (rack-mountable optional)	Token ring: DB-9	RS-232, RS-449, X.21, V.35, and 4-wire, short-haul modem	761 frame/sec	16,330 frame/sec	User-defined	HDLC	None	\$1,100/1 year
	TRE-8	Remote	3	Stand-alone (rack-mountable optional)	Token ring: DB-9	RS-232, RS-449, X.21, V.35, and 4-wire, short-haul modem	761 frame/sec	16,330 frame/sec	User-defined	HDLC	None	\$1,700/1 year
	MBE-1	Remote	2	Stand-alone	Ethernet: DB-15, AUI, BNC, RJ-45	RS-232, RS-449, X.21, V.35, and 4-wire, short-haul modem	380 packet/sec	10,000 packet/sec	User-defined	HDLC	None	\$900/1 year
	MBE-8	Remote	2	Stand-alone	Ethernet: DB-15, AUI, BNC, RJ-45	RS-232, RS-449, X.21, V.35, and 4-wire, short-haul modem	380 packet/sec	10,000 packet/sec	User-defined	HDLC	None	\$1,500/1 year
<b>RAD Network Devices, Inc.</b> Huntington Beach, Calif. (714) 891-1446	LEB	Local	2	Stand-alone	Ethernet, FDDI: DB-15, RJ-45, AUI	NA	12,500 packet/sec	25,000 packet/sec	Any bit in the packet, custom	STP	SNMP, proprietary	\$3,195/1 year
	LTB	Local	2	Stand-alone	Token ring, FDDI: DB-9	NA	40,000 packet/sec	120,000 packet/sec	Any bit in the packet, custom	SR, STP, SRT	NetView, LAN Network Manager, proprietary	\$4,995/1 year
<b>Raycom Systems, Inc.</b> Van Nuys, Calif. (800) 288-1620	FDDIring 100	Local	2	Stand-alone	Ethernet: AUI, RJ-45; FDDI: MIC	NA	10,000 packet/sec	Ethernet: 14,800 packet/sec; FDDI: 500,000 packet/sec	User-defined	STP	SNMP	\$18,500/1 year
	FddiRING 200	Local	2	Stand-alone	Token ring: RJ-45, DB-9; FDDI: MIC	NA	3,000 frame/sec	307,200 frame/sec	Source, destination, protocol	SR, STP	SNMP, NetView, LAN Network Manager	\$18,500/1 year
	FddiRING 110	Local	2	Stand-alone	Ethernet: AUI, DB-15, RJ-45	NA	10,000 packet/sec	14,800 packet/sec	Source, destination, protocol	STP	SNMP	\$12,900/1 year
<b>Retix Santa Monica, Calif.</b> (800) 225-2333	2200 Series Local Bridges	Local	4	Stand-alone	Ethernet: BNC, DB-25	NA	8,400 packet/sec	12,000 packet/sec	All fields	STP	SNMP, CMIP	From \$1,950 to \$2,950/1 year
	4660/S Local Bridge	Local	2	Stand-alone	Ethernet: DB-25, BNC, RJ-11; FOIRL: ST	NA	13,650 packet/sec	29,000 packet/sec	User-defined	STP	SNMP, CMIP	\$3,650/1 year
	3660	Local	2	Stand-alone	Token ring: DB-9	NA	4M bit/sec: 850 frame/sec; 16M bit/sec: 1,600 frame/sec	Wire speed	Filters all frames	SR	LAN Network Manager	From \$5,850/1 year
	4850 Remote Bridge	Remote	4	Stand-alone	Ethernet: DB-15, BNC, RJ-11, RJ-45	RS-232, RS-449, X.21, X.25, V.35, T-1, fractional T-1, E-1	1,200 packet/sec	9,000 packet/sec	All fields	LAP B	SNMP, CMIP	\$5,950/1 year
	4880 Remote Bridge	Remote	5	Stand-alone	Ethernet: DB-15, BNC, RJ-11, RJ-45	RS-232, RS-449, X.21, X.25, V.35, T-1, fractional T-1, E-1	8,000 packet/sec	14,880 packet/sec	All fields	STP, LAP B	SNMP, CMIP	\$6,950/1 year
	4820 Remote Bridge	Remote	5	Stand-alone	Ethernet: DB-15, BNC, RJ-11, RJ-45	RS-232, RS-449, X.21, X.25, V.35, T-1, fractional T-1, E-1	870 packet/sec	9,000 packet/sec	All fields	STP, LAP B	SNMP, CMIP	\$4,950/1 year
<b>Simpact Associates, Inc.</b> San Diego, Calif. (800) 275-3889	CNS 6200	Local/Remote	10	Stand-alone	Ethernet: NA	RS-232, RS-422, RS-449, X.25, V.35, T-1	NA	NA	NA	HDLC	NA	\$11,250/1 year
<b>Technically Elite Concepts, Inc.</b> Hermosa Beach, Calif. (800) 659-6975	Network Professor/Interchange	Local	4	Stand-alone	Ethernet: AUI, RJ-45, BNC	NA	29,760 packet/sec	59,520 packet/sec	All fields, user-defined	STP	SNMP, DECmcc Director	\$14,700/90 days
<b>3Com Corp.</b> Santa Clara, Calif. (800) 638-3266	ISOLAN FDDI/802.3 Bridge	Local	2	Stand-alone	Ethernet, AUI; FDDI: MIC	NA	14,000 packet/sec	460,000 packet/sec	Address, user-defined	STP	CMIP	\$15,000/1 year
	ISOLAN Primary Bridge	Local	2	Stand-alone	Ethernet: AUI	NA	13,000 packet/sec	17,100 packet/sec	None	None	None	\$2,400/1 year
	ISOLAN Remote Bridge	Remote	5	Stand-alone	Ethernet: AUI	RS-232, RS-422, RS-449, X.21, X.25, V.35, T-1, fractional T-1, E-1	1,230 packet/sec	12,500 packet/sec	User-defined, source, destination	STP	SNMP, CMIP	\$7,990/1 year
	ISOLAN 802.3 Bridge	Local	2	Stand-alone	Ethernet: AUI	NA	13,600 packet/sec	21,800 packet/sec	User-defined, source, destination	STP	CMIP	\$4,995/1 year
<b>Triticom Eden Prairie, Minn.</b> (612) 937-0772	Bridge ITI	Local	2	Stand-alone	Ethernet: AUI, BNC, RJ-45	NA	15,000 packet/sec	30,000 packet/sec	Address	STP	None	\$695 (software), plus 2 Ethernet adapters at \$150 each/60 days



# Dedicated bridges (continued from page 51)

Vendor	Product	Bridge type	Total ports	Configuration	LAN support and connector type	WAN support	Forwarding rate	Filtering rate	Filtering criteria	Link-level protocol	Management support	Price/Warranty
Vitalink Communications Corp. Fremont, Calif. (800) 443-5740	Translan	Remote	9	Stand-alone	Ethernet: AUI; token ring: DB-9	RS-232, RS-422, RS-449, X.21, V.35, T-1, fractional T-1, E-1	7,000 packet/sec	14,880 packet/sec	All fields	STP, HDLC	SNMP, proprietary	From \$7,750 to \$19,750/1 year
Xyplex, Inc. Glenview, Ill. (800) 788-7244	MX 6020 R	Remote	3	Stand-alone	Ethernet: 15-pin AUI	RS-232, RS-449, X.21, V.35, T-1, E-1, frame relay	2,800 packet/sec	14,880 packet/sec	All fields, user-defined	STP, HDLC, PPP, frame relay	SNMP	\$3,995/3 years
	MX 3010	Local	2	Stand-alone	Ethernet: 15-pin AUI	NA	10,000 packet/sec	29,700 packet/sec	All fields, user-defined	STP	SNMP	\$3,695/3 years

AUI = Attachment unit interface  
BRI = Basic Rate Interface  
CMIP = Common Management Information Protocol  
DECmcc = DEC Management Control Center  
FOIRL = Fiber Optic Inter-Repeater Link  
ISA = Industry Standard Architecture  
LAP B = Link Access Procedure B  
MAC = Media access control

MCA = Micro Channel Architecture  
MIC = Media interface connector  
NA = Not applicable  
PPP = Point-to-Point Protocol  
RF = Radio frequency  
SR = Source routing  
SRT = Source routing transparent  
STP = Spanning Tree Protocol

This chart includes a representative selection of dedicated bridges. These vendors may offer other products, and other vendors not listed may offer similar products.

SOURCE: M/R CONSULTING COMPANY, INC., SEATTLE

(continued from page 46)

"LAN of the future" as was anticipated. If prices fall enough to support FDDI on twisted-pair wiring, sales may increase. Many vendors now offer FDDI support for both local and remote bridges.

FDDI bridges are but one solution to the problems of a bridged network that has outgrown a backbone Ethernet. Others are multiport bridges, address filtering or routers.

DEC, FiberCom and Fibronics are among those vendors offering FDDI bridges. Of those, the DECbridge 500 Series is a two-port local bridge, while FiberCom offers a 30-port local/remote bridge, and Fibronics offers six- and 14-port local bridges.

## Fault tolerance/redundancy

High-availability applications, such as a database or transaction processing application, require fault tolerance because of recovery time requirements. If a bridge takes too long to recover, it may drop a session.

Fault tolerance hasn't yet hit the internetworking market in full force. The fault-tolerant features that bridge vendors offer are actually basic features such as hot swapping of boards and backup power supplies.

In the internetworking market, the minimum requirements for fault tolerance are met with backup power supply, hot swapping of components (without taking down the entire network to replace components) and load sharing. Vitalink is one vendor that offers fault-tolerant bridges.

## Other trends

Most local bridges still support like-to-like LAN connections (for example, Ethernet to Ethernet), but an increasing number are

connecting different technologies, such as Ethernet to token ring.

Bridge prices are declining by

The basic approach is to give each high-bandwidth device on a LAN, such as a server, its own 10M bit/sec port on the LAN

# Fault tolerance hasn't yet hit the internetworking market in full force.

▲▲▲

about 10% or less, particularly for local bridges, due to the competition in that end of the market. Reliable bridges are available for under \$5,000. On the whole, vendors are adding functionality to existing products rather than cutting prices, and in some cases, prices have inched up.

Remote bridge vendors are adding routing software, primarily TCP/IP, to bridges. Multiport bridges are increasing in number and functionality, and they should appeal to users who wish to subdivide LANs and link them via a single unit as opposed to using a backbone approach.

In general, buyers should expect to see more card-based bridges and the advent of Reduced Instruction Set Computing-based processors delivering greater horsepower. Rack-mounting is also becoming a common option to the stand-alone desktop box.

## Multiport alternatives

Bridging technology segments a network into smaller subnets to reduce contention and collisions on the network. An alternative to bridging is switching. Switches, such as Kalpana, Inc.'s EtherSwitch, combine switching and bridging in a single box.

switch, which any work group can access directly. In contrast to a bridge, where a user might have to go through multiple bridges to get to multiple servers, the switch allows parallel, simultaneous conversations between work groups and servers.

Kalpana's EtherSwitch EPS-700 supports seven parallel Ethernet processors, filtering on destination addresses at 14,880 packet/sec per port or 104,160 packet/sec aggregate.

EtherSwitch EPS-1500 supports 15 parallel processors, for an aggregate filtering rate of 223,200 packet/sec. Because the device switches packets rather

eliminating the bridge's expensive processing overhead, the switch is typically less expensive than a bridge.

One approach to comparing bridge and switch costs is to calculate the packet/sec cost (for seven or 15 simultaneous conversations) of throughput or capacity.

Another switching alternative is the ISDN Basic Rate connections from Develcon Electronics, Ltd. and Network Express, Inc. While most bridges operate on dedicated circuits, these connections allow public switched cir-

traditional dedicated bridges and hybrid bridge/routers. This market overlap can confuse buyers, and some vendors undoubtedly will pressure customers to select the newer, more expensive and slower bridge/routers.

## Bridging is still best

But to a certain degree, bridging is still the best way to go. The flexibility of routing combined with its added security can become a necessity as the net grows, and it may be needed to deal with protocols such as TCP/IP that are subject to broad-

# To a certain degree, bridging is still the best way to go.

▲▲▲

cuits to act as temporary dedicated circuits, providing variable bandwidth as needed.

If a dedicated line fails or doesn't have enough bandwidth, the bridge automatically cuts

cast storms in bridged nets.

Because bridges are still cheaper and faster than routers, there is a strong incentive to manage growth through bridging wherever and for as long as it is practical.

Vendors are responding to the growth and change in user nets by adding flexibility and functionality to their bridges. As a result, users are likely to spend more for bridges this year, but they'll gain more in return, too. □

# If a bridge takes too long to recover, it may drop a session.

▲▲▲

than processing them, packet processing overhead is limited, and latencies are reduced. The switches sell for \$10,995 and \$19,995, respectively, at their maximum configurations. By

over to a switched line. The bridge sees the LAN packet, knows where to go and autodials.

By adding base-level routing functionality to bridges, vendors are blurring the lines between

*Cope is president of M/R Consulting Company, Inc., a Seattle-based marketing research and consulting firm specializing in data communications. She also directs research projects for industry analyst Frost & Sullivan, Inc. in New York.*



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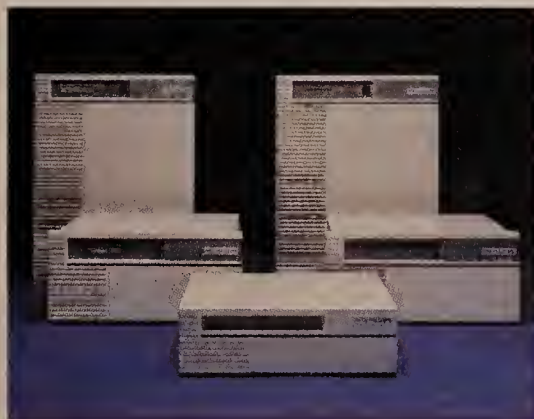
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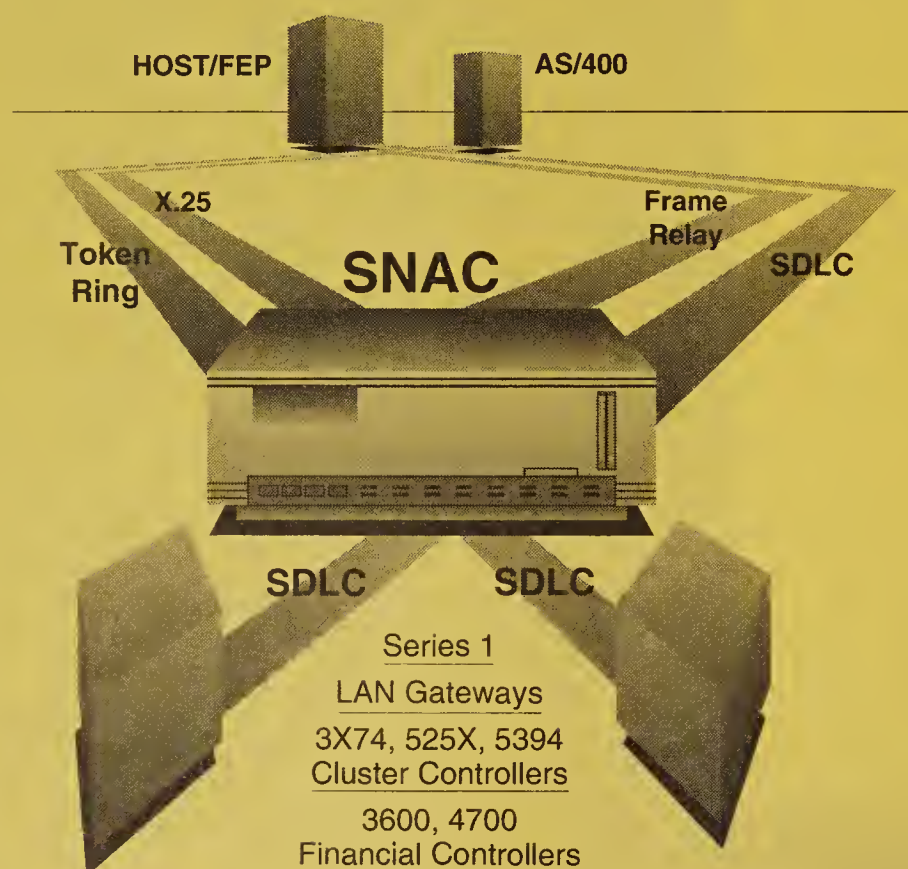
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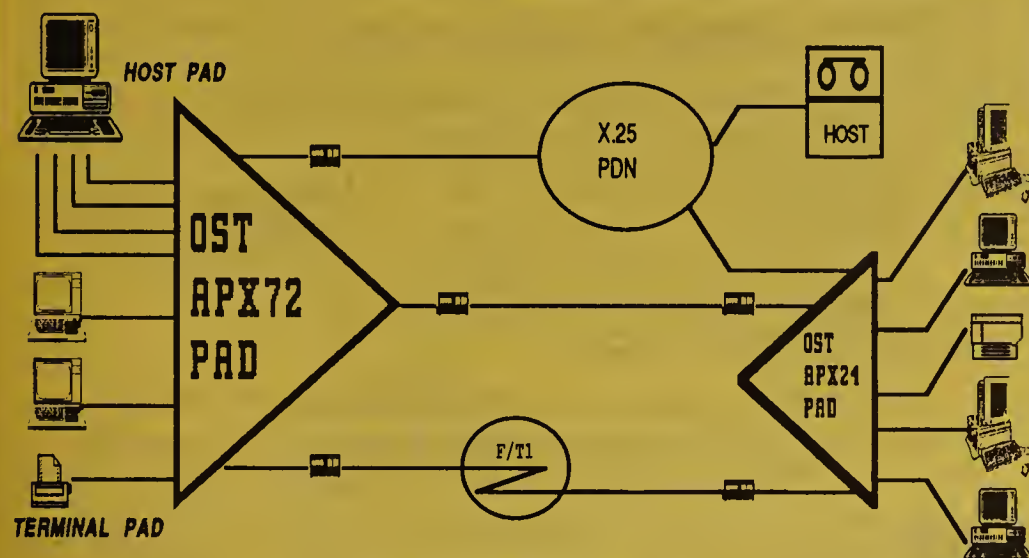
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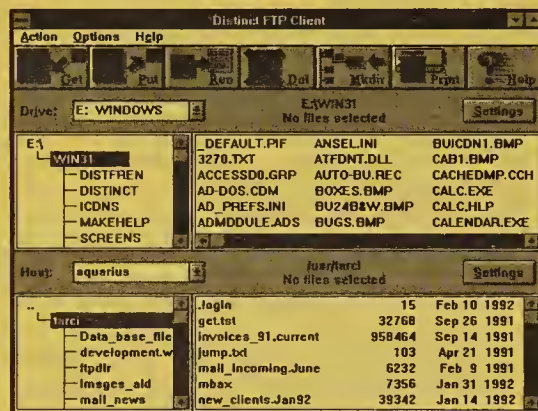
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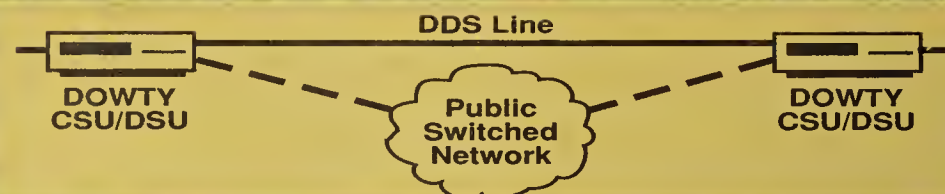
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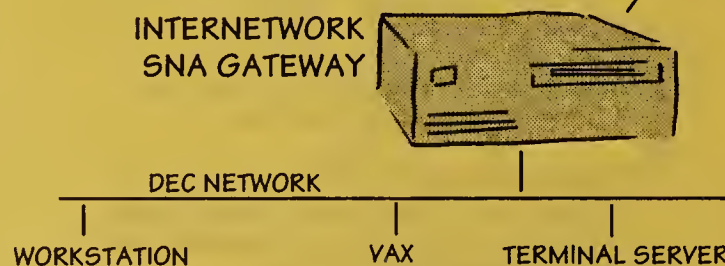
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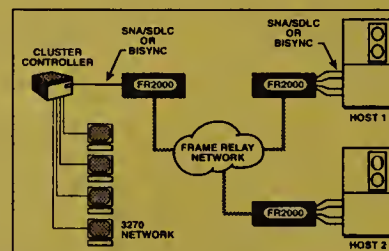
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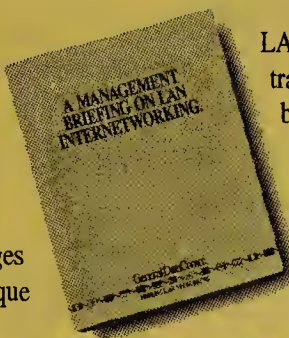
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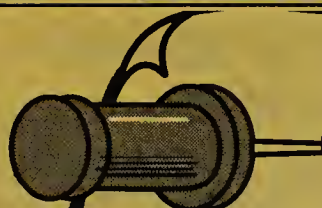
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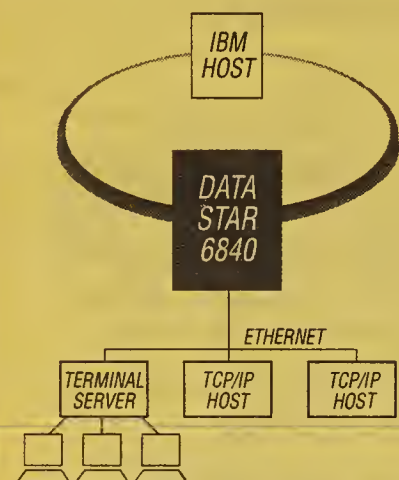
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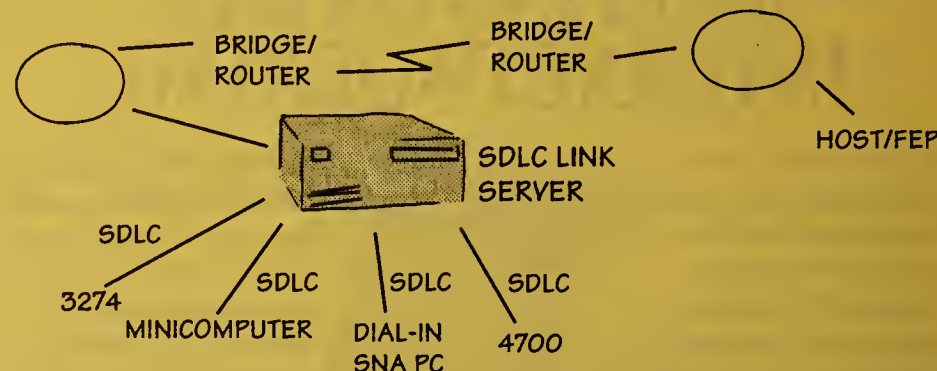
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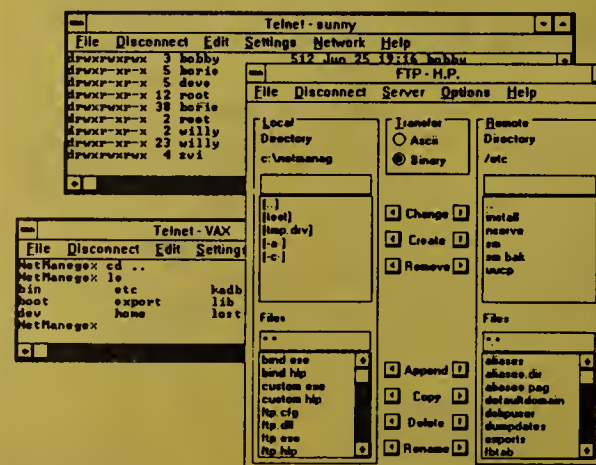
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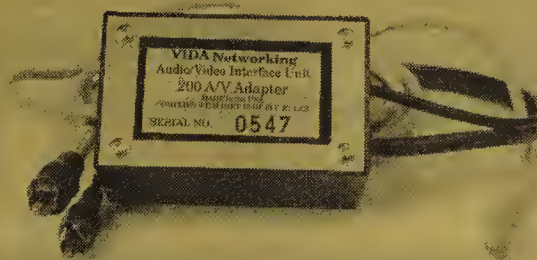


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By Paul Longoria

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CLOSES JUNE 17



# Bill would give MFJ control

*continued from page 8*

of the market, thereby gaining virtual monopoly control over new business areas.

"A national policy should not allow local telephone companies to undermine competitive market forces and abuse captive ratepayers," the group said.

Included in the group is the International Communications Association, the Florida Ad Hoc Telecommunications Users Committee, AT&T, MCI Communications Corp. and the Consumer Federation of America.

## Protecting their turf

The RBHCs were staunchly against codifying Modified Final Judgment provisions in law. They argue that the bill is a thinly disguised attempt by newspapers, manufacturers and long-distance carrier lobbyists to protect their turf.

Bob Levetown, vice-chairman of Bell Atlantic Corp., labeled the bill "a craven sacrifice of public to private interests."

Under the bill's provisions, an RBHC can enter a new market if it

can prove there is no substantial possibility of using its monopoly power to impede competition. If anyone can prove potential injury by Bell market entry, the decision will be handed over to the District Court for review.

"The process [of trying to enter new business areas] is still as time-consuming and iffy as going to Judge Greene," said a Bell-South Corp. spokesman.

The RBHCs also complained that the bill only allows them to apply for entry into new business areas after specified time periods but does not guarantee they will win that freedom.

Tom Tauke, vice-president of government affairs at Nynex Corp., agreed. "Today, we have the ability to go to the court and petition for a waiver [to enter restricted businesses]," he said. "The Brooks bill says that for seven years we can't even go to the court to make a case."

Past legislation dealing with narrower aspects of the ruling has failed to go far, but observers said the Brooks bill stands a good chance of passing. Brooks is an influential member of Congress and heads the U.S. House Judiciary Committee. ☐

# Cisco product blends functions

*continued from page 2*

eight or 16 asynchronous ports and has a standard 2M bytes of memory that can be expanded to 4M or 10M bytes. The device's asynchronous ports can support local- or wide-area links of up to 38.4K bit/sec. It replaces Cisco's STS-10X terminal server.

The nine-slot ASM-CS, which can support as many as 112 ports, holds modules equipped with Ethernet, token-ring or synchronous serial interface ports, as well as Flash Memory.

The synchronous serial interface can support a single wide-area interface up to T-1 speeds, including X.25, frame relay, Switched Multimegabit Data Services and Integrated Services Digital Network interfaces. It replaces the vendor's MSM and ASM terminal server-only units.

The products also support an X.25 packet assembler/disassembler capability, which obviates the need for a separate X.25 PAD.

In addition, both models support TCP/IP. Cisco said it will include additional protocols in future releases.

The TCP/IP support allows remote nodes using dial-up lines to participate as full IP nodes with systems on the central LAN, meaning users can conduct file transfers and exchange electronic mail, for example.

As a terminal server, the CCS supports virtual terminal protocols including Telnet; tn3270 for IBM terminal emulation; rlogin, a Telnet protocol for Unix operating systems; and Digital Equipment Corp.'s LAT. Users can establish multiple host sessions and switch among them.

In addition, channeling traffic through a single CCS using a dial-up link eliminates the need for multiple lines and modems for remote PCs and terminals.

The CCS can also act as a gateway server to provide protocol translation between Telnet, LAT, rlogin, X.25 and tn3270.

The CCS is equipped with support for the Serial Line Internet Protocol (SLIP), a transport protocol for running TCP/IP data over asynchronous lines, as well as the Point-to-Point Protocol, which enables users to support TCP/IP applications such as file transfers or mail transfers over serial lines.

The product also supports the XRemote protocol, developed by Network Computing Devices, Inc.

Available in the third quarter, the 500-CS is priced at \$3,995 for a 16-port configuration and \$3,295 for eight ports. The ASM-CS is priced at \$12,995 for 80 ports and at \$14,495 for 112 ports. It will be available in the fourth quarter.

Optional support for LAT and protocol translation is \$450 for the 500-CS and \$1,400 for the ASM-CS. ☐

# Trio positions hubs as servers

*continued from page 10*

built Access/Open as a separate chassis from Access/One to provide more flexibility.

For example, Ungermann-Bass plans to add new buses, such as Sun Microsystems, Inc.'s SBus or Digital Equipment Corp.'s VME bus, to support applications written for those hardware platforms, he said.

These buses might be more difficult to squeeze into an Access/One hub, which already supports several buses.

Access/Open is available in limited quantities with full production scheduled for August. Prices start from \$7,990.

## NetWorth's NetWare support

NetWorth, a Dallas-based maker of LAN hubs that is 50% owned by Ungermann-Bass, will support NetWare with the NetWare Runtime-based NetWare Application Engine module for its Series 4000 hubs.

The modules will be configured with an Intel 80486 processor, a 120M-byte hard drive and up to 32M bytes of memory. They will be designed primarily to run

NLMs, whereas Ungermann-Bass will support a broader set of applications.

Among the first applications to be available for the NetWorth hubs will be a Novell multiprotocol routing NLM and another developed by NetWorth supporting the Hub Management Interface.

Users will be able to install multiple engines in NetWorth hubs and support a variety of applications on each module.

NetWorth's NetWare Application Engines will be available in August.

Pricing for the products will be revealed in June.

Lee Roth, Southwest Airlines Co.'s LAN systems manager, said he was told by NetWorth officials that the engines will probably be priced at less than \$5,000, which is attractive when compared to a stand-alone router, for example. Roth said he would like his company to serve as a beta site for the modules.

"If you piled all the NLMs you wanted on a NetWare server, you'd bog the thing down," Roth said. "I could run applications like routing and NetWare for SAA on a hub with a high-speed backplane that would [offer] better performance." ☐

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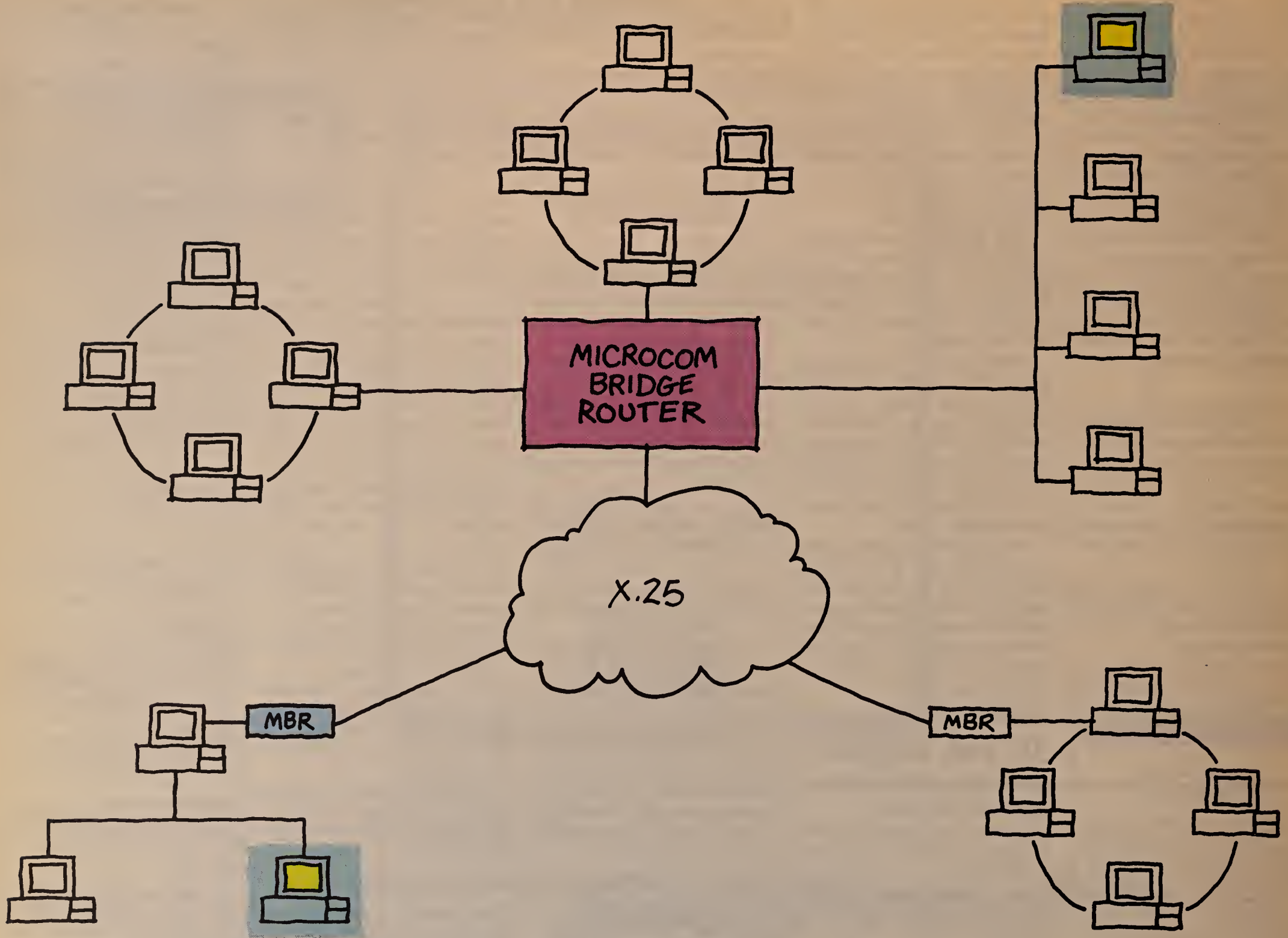
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